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Report RM-203**

The Conservation Reserve—Yesterday, Today and Tomorrow

Symposium Proceedings

January 14, 1991

Linda A. Joyce, John E. Mitchell, Melvin D. Skold, editors

Preface

This proceedings is the product of the combined efforts of Task Forces formed under two different organizations. These papers were presented at the 1991 meeting of the Society for Range Management in a Symposium titled "The Conservation Reserve—Yesterday, Today and Tomorrow".

The Range Plant Task Force was organized in 1988 by the Great Plains Agricultural Council upon recommendation from its Range and Livestock Committee. The Task Force was to study the ecological and managerial problems associated with the Conservation Reserve Program. Subsequently, the Society for Range Management formed a task force to evaluate the Conservation Reserve Program. Because the acreage signed up for the Conservation Reserve Program (CRP) is heavily concentrated in the ten Great Plains States, and due to coincidence of professional interest on the part of these two Task Forces, they combined their energies to sponsor a Symposium on the Conservation Reserve Program at the 1991 Society for Range Management meetings.

Planning for the one half day Symposium was completed in a joint meeting involving members of the two Task Forces. The topics to be addressed and the authors to prepare the papers were identified by the symposium planners. Given the limitations of time on the program of the SRM Annual Meeting, several papers were presented as poster papers rather than presented orally. This proceedings includes the papers given in oral presentation and those presented in a poster format.

The symposium and this proceedings would not have been possible without the efforts of several key individuals on the GPAC Range Plant Task Force and the SRM Task Force on the CRP. Harold Goetz (CO) served as convener of the Symposium and Bill Laycock (WY) served as the moderator. John Mitchell (USDA-FS/CO) was an editor of the proceedings until being called up to Operation Desert Shield. Linda Joyce replaced John in that role. Members of those Task Forces were:

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Symposium Co-Sponsors:

Society for Range Management

Great Plains Agricultural Council

USDA Forest Service

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The Conservation Reserve Program—How Did We Get Where We Are and Where Do We Go From Here?

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Abstract.—The main question about CRP is "what will happen to these lands when the 10-year contracts begin to expire in 1996?" A history of land use on the Great Plains is presented to put CRP into perspective. Many of the problems with the CRP probably are related to the fact that it was implemented so quickly.

Introduction

This symposium is being held at both an appropriate place and at an opportune time. The legislators, federal agencies, professional and trade associations, and lobbyists located in Washington, DC, will be the major players in the future of Conservation Reserve Program (CRP). The time is appropriate because we are now approximately half way through the first cycle of contracts of CRP, with 5 years of experience with the CRP program and 5 years left to make major decisions about the future of the lands now in CRP. The time is also appropriate because the 1990 Farm Bill was passed last year, which authorized the continuation of the Conservation Reserve Program and the other conservation provisions of the Food Security Act of 1985.

When talking about the future, the predominant question is: what will happen to the CRP lands when the 10-year contracts begin to expire in 1996? This question was the focus of two 1987 symposia, one sponsored by the Society for Range Management and others (Mitchell 1988), and the other by the Soil and Water Conservation Society (1988). Most of the speakers to follow in the present symposium will use this question as the dominant theme of their presentations.

The symposium consists of two parts: (1) impacts on people and (2) impacts on resources. However, the two subjects really cannot be separated. The section on "people" will include discussions of the CRP legislation, mainly the 1985 Food Security Act and the 1990 Farm Bill, the effects of economics on the decision to retain CRP lands in permanent cover or to put them back in to crop production, and the options a landowner has on his lands after CRP ends. The section on resources will contain information on what effect CRP is having on environmental quality including reduction of soil erosion and improvement of water quality, how CRP lands have benefitted wildlife and recreation, and the implication these uses may have on the decision to plow CRP lands, and the future costs and benefits of various uses of CRP lands after the contracts expire.

About one-half of the lands in the CRP are in the Great Plains, and it is in the Great Plains and other areas of the western United States where lands now in CRP are most likely to be converted back to farmland. The objective of this paper is to review the history of settlement and land use on the Great Plains to try to get a better appreciation of what took place before CRP and, possibly, some clues as to the future of CRP lands in the Great Plains after contracts end. I will also discuss my perceptions of some of the shortcomings of how the CRP was implemented. These shortcomings may have a major influence on how much CRP land will stay in permanent cover.

History of Settlement and Land Use

Early Explorers and Travellers Across the Plains

The Great Plains, as defined in this paper, are the treeless steppes which lie west of the 98th Meridian and east of the Rocky Mountains. The Great Plains were called "The Great American Desert" during the 19th century, a name prophetic of the conditions during the drought and Dust Bowl of the 1930's.

The first human inhabitants of the Great Plains were the mainly nomadic and nonagricultural Plains Indians.

Spanish explorers entered the Plains in the 16th and 17th centuries but had little effect on land use on any but the extreme southern plains. Various explorers (Lewis and Clark, Pike, Long) explored parts of the Plains in the early 19th century. Fur trappers also crossed the Plains at about the same time to get to the mountains to trap beaver (Laycock 1988).

Starting in the early 1840's, a great number of travellers passed through the Great Plains but had no intention of settling in "The Great American Desert." Dorn (1986) estimated that 350,000 people crossed Wyoming on the Oregon, Mormon. and California trails between 1841 and 1866.

Settlement of the Plains

The cattle barons.—Large numbers of cattle accumulated in Texas during the Civil War. After the war, cattle were worth from $0.50 to a few dollars in Texas, but up to $50 per head at the railheads in the Midwest. This was the economic incentive for the large herds of longhorns to be driven first to the railroad at Sedalia, Missouri, and Abilene, Kansas, but very soon to stock the grasslands of the Plains. The first trail herd whose destination was the western Great Plains was brought through New Mexico in 1866 by Charles Goodnight and Oliver Loving and were sold to John Wesley Iliff near Greeley, Colorado. Large ranching operations using "free grass" were formed in the 1860's and 1870's using largely English and Scottish capital (Laycock 1988). Cattle numbers on the Great Plains increased from 1.1 million in 1870 to 4.4 million in 1880 to 8 million in 1886 (U.S. Senate 1936).

Mild winters apparently had prevailed on the Plains from the 1860's through the mid-1880's, and few, if any, of the ranchers on the Plains put up hay for winter emergencies. The winter of 1885–86 was quite severe on the southern Plains, and the winter of 1886–87 was even more severe on the northern Plains. During these years, hundreds of thousands (or perhaps millions) of cattle froze, suffocated, or starved to death (Mitchell and Hart 1987).

The railroad and the homesteaders.—The beginning of the erosion problems on the Great Plains began with the onset of farming in the area. Congress passed the Homestead Act in 1862, which allowed a person to farm and claim 160 acres. The more fertile lands of the eastern Great Plains were homesteaded first, and there 160 acres was sufficient to make a living. By the mid-1880's, the homesteaders began to arrive the western part of the Great Plains. A great many of these newcomers homesteaded lands with soils and climate that was completely unsuitable for farming.

The transcontinental railroad was built across the western Plains in the late 1860's, and spur lines were built in the 1870's and 1880's. The railroads were anxious to sell some of the government lands they had been granted as a subsidy to build the railroad and also to build a revenue base from passengers and freight. Promoters called "Land Boomers" made extravagant claims about the productivity of the land and claimed that "Rain Follows the Plow" (McGinnies and Laycock 1988). Not only were the claims exaggerated, but the new farmers brought farming techniques from the more humid eastern United States and Europe that were not suited for the semiarid climate of the Great Plains. This set the stage for the Dust Bowl that was to come, which, in turn, led to all of the subsequent conservation measures on the Great Plains, including the most recent, the CRP and other conservation measures of the Food Security Act of 1985.

Drought and the Dust Bowl

Worster (1979) and Hurt (1981) presented detailed documentation on the drought and Dust Bowl of the early 1930's. Starting about 1931 and continuing until 1936 or 1937, precipitation in the Plains was quite low. By 1933, almost any wind created dust storms from fields where no crops grew. The major dust storms occurred in 1934 and 1935, some of which reached the East Coast. Spurred into action, Congress, in 1935, passed the first conservation measure for the Plains—the Bankhead-Jones Act. One portion of this law authorized the government to buy submarginal land that was not capable of supporting a family. The land was grouped into "Land Utilization Units" throughout the western Great Plains. These LU Projects, totalling about 6 million acres, were administered by the newly created Soil Conservation Service (SCS) from 1938–1954. In 1954, the USDA Forest Service began to administer most of these lands as "national grasslands."

The New Sodbusters

The newly created SCS helped farmers put a great number of conservation practices into effect in the years following the Dust Bowl. These practices included contour plowing, crop rotation, and many others. Additional land came under cultivation during the 1940's because of generally favorable precipitation, government encouragement of wheat production during the war and high wheat prices after the war.

Following this period, not many new acres entered cropland production until the 1970's. After a large wheat sale to Russia in 1972, wheat prices rose and new land, never previously cultivated, began to be broken. Little attention was paid to this new plowing until the early 1980's when very large areas plowed in Colorado and Montana drew national press and television coverage. At least 4.5 million acres of previously unbroken grassland were plowed in the 1970's and early 1980's in the central and northern Great Plains (Laycock 1988, Laycock and Lacey 1984). The extent and potential environmental consequences of this large amount of plowing of largely fragile lands with erodible soils was the catalyst that led directly to the conservation provisions of the 1985 Food Security Act.

History of Revegetation Efforts on the Plains

Land utilization projects.—By 1951, approximately 1 million acres had been seeded on the almost 6 million

acres of the Land Utilization Projects purchased during and after the Dust Bowl. These projects were put under proper grassland management and retained in federal ownership by the SCS until 1954 and then by the USDA Forest Service, preventing any replowing. During periods of high wheat prices, there have been periodic calls for selling these lands to private owners so that they could be farmed. These efforts illustrate the overwhelming influence of economics over conservation in the United States and reinforce the wisdom of continued government ownership of these erodible lands to keep them from being plowed again.

Shelterbelts.—In 1934, at the height of the Dust Bowl, the federal government proposed to plant windbreaks of trees and shrubs in a strip 100 miles wide from the Canadian border through Oklahoma. Starting in 1935 and ending in 1942, the effort resulted in planting of 223 million trees on 30,000 farms and ranches (Anonymous 1986). Most of the shelterbelts stayed in place until the early to mid-1970's when farm and machinery size increased, shelterbelts began to be viewed as "in the way," and the government called for maximum production and plowing "from fencerow to fencerow." Thus, official government policy reinforced by federal subsidies encouraged the destruction of the trees that had been planted as part of a major government conservation program (paid for by taxpayers) 40 years previously. Unfortunately, these types of contradictory and self-defeating conservation policies have plagued the United States throughout most of the last 60 years.

Soil Bank Program.—The first official "Conservation Reserve Program" was part of the Soil Bank Act in 1956. The primary purpose of the program was to divert land from crop production. The secondary purpose was to establish and maintain protective cover (trees, grass, etc.) on land taken out of crop production (undated and unpublished file report, Soil Conservation Service "Final Report, Conservation Reserve Program, Summary of Accomplishments, 1956–1972").

The Soil Bank was voluntary and farmers contracted to withdraw designated areas of cropland from 3 to 10 years. At the peak of the program in 1960 and 1961, there were more than 306,000 farms with about 28.7 million acres under contract. About half of this total were areas in the Great Plains seeded to perennial grasses. The total cost of the program was about $2.5 billion for rental payments and $162 million for establishment cost sharing. The average annual payment was $11.85 per acre and the total payment for the life of the program averaged $86.43 per acre. The figures are in 1969 dollars. All contracts had expired by the end of 1969.

It is debatable whether the primary purpose of the Soil Bank Program, i.e., to divert land from crop production, was achieved (Laycock 1988). There were drops in wheat acreage in 1957 and again in 1969–72, but these drops appear to be more a response to separate set-aside programs during these years than caused by the Soil Bank Program (Laycock 1988). The secondary purpose to maintain protective vegetation also failed in the long run, at least on the Great Plains. A fairly dramatic increase in wheat acreage starting in 1973 in response to a large wheat sale to Russia and subsequent high wheat prices resulted in most of the Soil Bank lands on the Great Plains being plowed. Thus, the $2.5 billion spent had little effect on amount of land in crop production and certainly was not effective as a long-term conservation measure.

Conservation Reserve Program.—The CRP was intended to convert up to 45 million acres of highly erodible farm land to permanent cover. The other papers present details about the legislation and operation of the CRP. It is important to keep in mind that the CRP is a very expensive program. The average total payment for the 10-year life of a CRP contract will be about $400 to $500 per acre as compared to the $86 paid per acre over 7 years during the Soil Bank Program. Adjustment of the $86 to 1990 dollars would make this difference somewhat smaller but still significant. In the western Great Plains, this total amount per acre is many times what the land or conservation easements could have been purchased for at the time the contracts went into effect. The total cost of the program in CRP lease payments plus establishment costs alone could be between $18 and $20 billion if the total of 45 million acres is put into CRP.

Prospects for Success of CRP for Permanent Conservation

Will the CRP succeed where the Soil Bank failed? Will a significant amount of land remain in permanent cover when the CRP contracts start to expire in 1996? I think that one of the keys to land remaining in permanent cover is whether USDA policy and Congress will remain resolute in preventing replowing a majority of these lands when CRP ends. As pointed out earlier, history does not provide much encouragement that any such resolve will prevail. We seem to be very willing to modify our conservation laws and policies to take advantage of short-term economic opportunities (Laycock 1988). The challenge to the participants in this symposium, USDA, the Society for Range Management, and to all other interested professional organizations, agencies, and individuals is to make sure that our national resolve is strong enough to prevent a substantial proportion of these CRP lands from being plowed in the coming decade, thus undoing what has been accomplished in terms of reduction of erosion and improving water quality.

What Could We Have Done Differently?

Are there things that should have been done differently in the start-up of the Conservation Reserve Program? Since hindsight is so much more accurate than foresight, the answer obviously is yes. There were a number of things that were done or not done at the beginning of the program that now obviously will have an effect on many of the decisions farmers will make in the next decade about keeping CRP lands in permanent cover or plowing them. Some of these factors will be discussed below.

Crop Base was not Removed from CRP Lands

Other authors will discuss this. It appears that leaving the crop base attached to the lands in CRP probably is the single greatest factor which will almost guarantee the plowing of many of these lands when contracts expire unless this provision is changed. Perhaps the political reality was that the program could not have been passed if the crop base was removed. The 1990 Farm Bill extends the period before crop base is lost but this is simply postponing the decision.

Sodbuster Provisions Should Apply to CRP Lands

Because CRP lands were in crop production during the base years, the provisions of the Conservation Compliance section of the 1985 Food Security Act apply when these lands are considered for plowing again. It would have been appropriate for the more restrictive Sodbuster provisions to apply after these lands had been in permanent cover for 5 years.

Implementation was Too Rapid

In the first year (March 1986 through the fourth sign-up in February 1987), almost 18 million acres were enrolled in CRP. One year later, more than 25 million acres had been enrolled. This very rapid influx of lands into CRP had a number of negative consequences. Perhaps the political reality was such that such a rapid sign-up was necessary to make the program effective. Also, it may have been thought that the rapid retirement of lands from farming would have great environmental benefits and such desirable effect on commodity prices that these outweighed the negative aspects. One positive aspect of the rapid sign up was that it very possibly "saved" a great many farmers who were on the verge of bankruptcy. The following are some of the negative aspects associated with the large acreage enrolled in CRP so rapidly.

Seed supply and prices.—The large acreages being planted rapidly depleted existing supplies of quality grass and legume seed. This had three main effects: (1) price rose rapidly making the program even more expensive; (2) "junk" seed was sold and planted that had poor germination, contamination with noxious or other undesirable weeds; and (3) scarcity or price of seed of some species probably influenced choices of species to be planted and the most desirable or adapted species for a given area may not have been planted because seed was too expensive or not available. A much slower sign-up rate would have allowed seed supplies to increase, prices to remain more stable, and a better choice of species to plant would have been available.

Effects on local communities.—The rapid sign-up undoubtedly had immediate and drastic effects on the agricultural business components of many communities. The immediate loss of machinery, seed, fertilizer, and other sales probably was quite traumatic in counties that approached the 25% limit of land in CRP very quickly. A slower sign-up rate might have allowed at least some of these businesses to adjust and survive.

Inadequate time for planning.—The rapid sign-up rate did not allow adequate planning in at least two significant areas important to planning: location of land going into CRP in relation to the rest of the farm or ranch, and selection of proper species. Both will be discussed in more detail below.

Hasty or Improper Planning

As indicated above, this is related to the speed of sign-up. If there had been more time, better decisions could have been made by both the land owners and the SCS technicians about what the lands going into CRP would be used for at the termination of the 10-year contract. Some of the things that should be considered are:

Relationship to land uses on adjacent lands.—Isolated parcels of land surrounded by lands kept in crop production stand the greatest chance of being plowed at the end of the contract time. Ralph Heimlich will discuss the relationship of size of livestock operation on the probability of land being plowed and this is a related question. Should isolated tracts have been allowed to be enrolled into CRP? The "hindsight" answer appears to be no. Only if these lands will provide some economic return to the farmer will they stay in permanent cover. Small game hunting and/or recreation are probably the only possible uses of these isolated tracts to provide income, and these uses also have less value on isolated tracts than on lands adjacent to or connected to other lands with wildlife cover.

Improper or uninformed choice of species to be planted.—The rules relating to what species could be planted were not very uniform across the Plains. In many cases, it was stated or implied that, if an area was planted to native species, it would somehow be "more valuable" at the end of the contract and, thus, would stand a lesser chance of being plowed. The basis for this assumption was never stated, and, in many situations, the assumption probably was erroneous. For example, on some parts of the western Great Plains, where native rangelands are dominated by warm-season grasses, one basic need for many livestock operations is cool-season pastures. In these situations, insistence on the planting of native, warm-season species instead of introduced cool-season grasses may have dramatically increased the probability of the stand being plowed at the end of CRP. There was a valid fear that too many acres would be seeded to the readily available and cheap introduced species if there were no controls. However, *not* enough thought went into the bans that were imposed on planting of many introduced species. Certainly, there was insufficient planning time to determine what species or species mix would be *least likely* to be plowed at the end of 10 years because it fit best into the livestock operation or contributed in some way to income at that time.

Cover crop requirements inappropriate.—In some instances, the requirements for cover crops into which the perennial grasses would be seeded were not based on the most recent research information. In certain areas, there was a ban on seeding into wheat stubble. Both federal agriculture research and a vast amount of research

on reclaimed mine sites have indicated that wheat stubble is a good cover crop for establishing perennial grasses (McGinnies and Hassell 1988). This is only one example but others undoubtedly also occurred.

No Provision was Made for Research

In spite of the tremendous cost of the CRP, no money was allocated for research. Apparently, the assumption was that *all* of the needed technology to implement the program was available. In some areas, this was true, but, as indicated above, the most recent research information was not always used when the rules and regulations were written.

Much research has been done on species adaptation, planting methods, and similar topics, but there were some gaps in knowledge in 1985. Some of the knowledge gaps needed to make informed and intelligent decisions about establishment of permanent cover on croplands and influencing the decision to plow or not plow these lands were outlined by Mitchell and Evans (1988) in the 1987 CRP symposium sponsored by the Society for Range Management. They included:

Seedbed preparation techniques.—While much is known, specific recommendations for many situations are lacking. This was pointed out clearly by McGinnies and Hassell (1988). Allelopathic effects of cover crops on germination are poorly understood and often misinterpreted as was indicated earlier.

Development of wildlife habitat.—Again, although much is known, the specific practices that can be used by farmers to develop habitat for small game animals or birds are often rather vague. Methods to interplant species important to wildlife into pure grass stands are also needed.

Appropriate livestock grazing systems.—Continuous or season long cattle grazing systems have been the standard on the Plains. Much more information is needed on more intensive systems, such as short duration grazing, including their effects on wildlife habitat.

Benefits of windbreaks.—Little emphasis has been given to development of shelterbelts as a part of a given CRP acreage other than filter strips beside watercourses. The soil erosion reduction, snow accumulation and wildlife habitat values are incompletely known.

Soil loss models.—Additional research is needed for soil erosion and watershed models to be able to accurately predict actual erosion from rangelands or croplands converted back to rangeland.

Effects of CRP on local economies.—The effects of loss of supporting agricultural businesses caused by CRP have been discussed. Other effects about which little is known include: loss of winter forage in the form of crop residue, uncertainty about possibilities of income enhancement as a result of wildlife habitat development, impacts on local economies when CRP ends, and others.

Impacts of CRP on macro-level agricultural policy.—Little has been determined about this. How should USDA policy be structured to both take advantage of the benefits of CRP and also help stabilize the agricultural industry in the United States?

Mitchell and Evans (1988) proposed that a joint research program to support CRP be established that would include both federal and state agencies, professional societies, and universities. They concluded that, "The USDA is probably best suited to establish priorities, acquire funding, and monitor research progress...If adequate funds are obtained, the return on investment will be considerable, perhaps exceeding 10 to 1." This proposal was presented to various agencies but was not funded. Some research has taken place on a local scale, mainly by state agricultural experiment stations.

More recently, a research proposal was submitted to the Agricultural Research Service of USDA (personal communication, G. Schuman) which concentrated on developing management alternatives that might influence decisions on CRP lands. The objectives of this proposed research were to evaluate the effects of the specific alternative land treatments of continued forage vs. wheat cropping on:

1. Forage/hay productivity, nutritional quality and botanical composition;
2. Forage resource response to livestock grazing and/or hay cropping;
3. Soil erosional stability under grazing and/or hay cropping use;

and to determine the following:

4. The influence of varied site conditions (soils, precipitation) on treatment effectiveness;
5. The relative cost-effectiveness among treatment;
6. Compare the economic value of the various treatments for hay and/or grazing forage production to the alternative economic value of reversion to wheat production.

The research has not been funded, and the time is short for such research to be conducted so that the results will be of value when CRP contracts begin to expire.

The research that has *not* been done is that relating to the main question in this symposium, i.e., how can a majority of these lands be kept in permanent cover instead of being plowed again? This research is economic and social in nature and is still needed. The time for research results to be effectively applied is rapidly being lost, although some short-term research could still have an impact on the future of CRP lands in 1996 and beyond.

Conclusions

What I have tried to do is set the stage for the remaining papers. The historical information may give some perspective of how we got where we are with the CRP program. The discussion of the possible errors that were made in implementing the CRP may give managers and policy makers some insight into the reasons why we probably will face problems keeping CRP lands in permanent cover after contracts end. The research needs are ongoing and need to be considered as a high priority quite soon if some of the potential problems are going

to be solved. If Congress and policy makers ignore the concerns expressed in this symposium, then the fears that a large proportion of the CRP lands will be plowed when the contracts end will be realized.

Literature Cited

Anonymous. 1986. Great Plains forestry: history worth repeating. American Tree Farmer. 5(3): 13–14.

Dorn, R. D. 1986. The Wyoming landscape, 18-5-1878. Mountain West Publications, Cheyenne, WY. 94 p.

Hurt, R. 1981. The Dust Bowl: and agricultural and social history. Chicago, IL: Nelson Hall. 214 p.

Laycock, W. A. 1988. History of grassland plowing and grass planting on the Great Plains. In: Mitchell, J. E., ed. Impacts of the Conservation Reserve Program in the Great Plains. Gen. Tech. Rep. RM-158. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 3–8.

Laycock, W. A.; Lacey, J. 1984. Extent and impact of "plowout" of native grasslands on the Great Plains. Abstracts of papers (New York, NY, May 24–29, 1984). Publ. 84–4. American Association for the Advancement of Science Meeting: 47.

McGinnies, W. J.; Hassell, W. G. 1988. Establishment of native and introduced range plants in the central Great Plains. In: Mitchell, J. E., ed. Impacts of the Conservation Reserve Program in the Great Plains. Gen. Tech. Rep. RM-158. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 35–41.

McGinnies, W. J.; Laycock, W. A. 1988. The great American desert—perceptions of pioneers, the dust bowl and the new sodbusters. In: Whitehead, E. E.; Hutchinson, C. F.; Timmermann, B. N.; Varady, R. G., eds. Arid lands today and tomorrow: proceedings, international research and development conference; Tucson, AZ. Boulder, CO: Westview Press: 1247–1254.

Mitchell, J. E. 1988. Impacts of the Conservation Reserve Program in the Great Plains. Gen. Tech. Rep. RM-158. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Mitchell, J. E.; Evans, G. R. 1988. A prospectus for research needs created by passage of the Conservation Reserve Program. In: Mitchell, J. E., ed. Impacts of the Conservation Reserve Program in the Great Plains. Gen. Tech. Rep. RM-158. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 128–132.

Mitchell, J. E.; Hart, R. H. 1987. Winter of 1886–87: the death knell of open range. Rangelands. 9: 3–8.

Soil and Water Conservation Society. 1988. American agriculture at the crossroads: a conservation assessment of the 1985 Food Security Act. Journal of Soil and Water Conservation. 43: 10–112.

U.S. Senate. 1936. The western range. Senate Document No. 199. Washington, DC: Government Printing Office. 620 p.

Worster, D. 1979. Dust Bowl: The southern Plains in the 1930's. New York, NY: Oxford University Press. 277 p.

An Overview of the Agricultural Resources Conservation Program

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Abstract.—The Food, Agriculture, Conservation and Trade Act of 1990 brought three new features to the conservations programs of the U.S. Department of Agriculture's Agricultural Stabilization and Conservation Service. This law keeps the Conservation Reserve Program and adds new features that redirect this program's emphasis toward environmentally sensitive land and that help farmers who are having difficulties complying with conservation plans. The new law also adds three programs: the Wetlands Reserve Program, Agricultural Water Quality Incentives Program, and the Environmental Easement Program. These four programs are described.

Introduction

The Food, Agriculture, Conservation and Trade Act of 1990 brought three new features to the conservation programs of the U.S. Department of Agriculture's (USDA) Agricultural Stabilization and Conservation Service (ASCS). Under the previous law, the Food Security Act of 1985, ASCS administered the Conservation Reserve Program (CRP), which sought to remove highly erodible and other environmentally sensitive cropland from production for 10 years. Annual rent payments to farmers are provided, and a one-time cost share for protective vegetative cover is also provided. The new 1990 law keeps the CRP, which originally emphasized soil erosion, and adds new features that redirect CRP's emphasis toward environmentally sensitive land and that help farmers who are having difficulties complying with conservation plans. The new law also adds three programs: the Wetlands Reserve Program (WRP), Agricultural Water Quality Incentives Program (WQIP), and the Environmental Easement Program. The four programs carry the designation, the Agricultural Resources Conservation Program (ARCP).

The Structure of ARCP

Under the umbrella ARCP (see fig. 1), Environmental Conservation Acreage Reserve Program (ECARP) comes first. ECARP is a subumbrella that covers the old

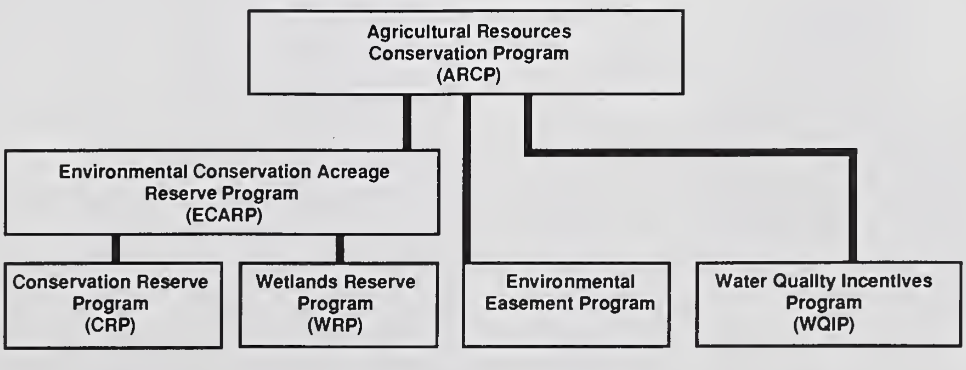

Figure 1.—Structure of the ASCS conservation effort under the Food, Agriculture, Conservation and Trade Act of 1990.

CRP—with eligibility criteria expanded by the new law—and the new WRP for protecting wetlands through easement.

The WQIP is designed to encourage producers in targeted areas to adopt more environmentally sound practices that complement their normal farming operations. Producers will be offered incentive payments to implement proven and effective management techniques that will allow them to continue to produce agricultural commodities for the market to insure a stable and reliable supply of food and fiber, while at the same time addressing water quality problems.

The Environmental Easement Program provides for permanent easements in areas deemed environmentally sensitive, such as riparian areas where wildlife species propagate, and areas providing additional habitat for wildlife. The government may share the cost for vegetative cover establishment, wetland protection, or water quality improvement, as determined by the Secretary of Agriculture.

The programs offer producers an opportunity to prevent land erosion, contribute to wetland conservation, keep pesticides and fertilizers from surface and ground water, and slow the loss of wildlife habitat.

Accomplishments and Objectives

Acreage

From 1985 through 1990, the CRP enrolled almost 34 million acres over nine signups (see fig. 2). If one assumes 400 million acres as the extent of U.S. cropland, then during the past 5 years CRP has accounted for the conversion of over 8% of the nation's cropland into grass and trees.

Under the 1985 law, the Secretary of Agriculture was authorized to enroll from 40 to 45 million acres into CRP. Under the 1990 act, ASCS will seek to enroll additional acreage into CRP. A goal of 1 million acres will be targeted for the WRP, and a goal of 40 to 45 million acres is established for the ECARP (including the WRP). In addition, incentives will be offered on up to 10 million acres for improvement of water quality (WQIP).

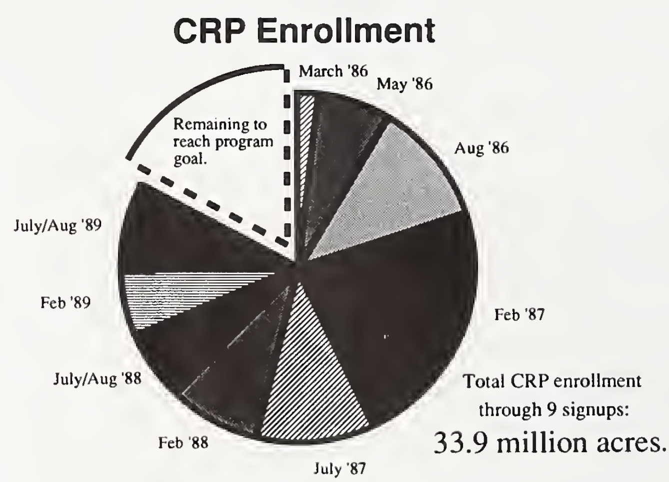

Figure 2.—CRP enrollment grows through the first nine signups.

This new comprehensive approach toward improving the environmental consequences of modern agriculture will provide producers a diverse set of program alternatives that they can implement, while at the same time continuing to maintain viable farming operations.

Easements

The new legislation expands the methods that ASCS uses to execute the program. Under the old law, CRP dealt almost exclusively in 10-year contracts. Under the new law, ASCS will deal not only with rentals, but it will also secure easements and provide incentive payments. Under easement provisions, ASCS will buy farming rights on agricultural land. Two programs, WRP and the Environmental Easement Program, are exclusively easement programs. WQIP is an incentives payment program whereby farmers continue cropping but adopt practices specified in water quality protection plans.

The Environmental Conservation Acreage Reserve Program

Acreage currently enrolled in the CRP is now considered enrolled in ECARP. ASCS has the goal of enrolling from 40 to 45 million acres by the 1995 calendar year.

The Conservation Reserve Program

The new CRP continues to target areas similar to the 1985 CRP, but flexibility is provided to allow water quality and other environmental concerns to be addressed in addition to highly erodible land. It emphasizes the protection of highly erodible lands through windbreaks and shelterbelt establishment, pasture land converted to trees in riparian areas, and water quality concerns. It seeks to enroll an additional 5 to 11 million acres, but reserves 1 million acres for enrollment in each of 1994 and 1995 to ensure an alternative for producers having difficulty complying with their conservation compliance plans. To the extent practical, one-eighth of the newly contracted CRP acres should be devoted to trees, shrubs, noncrop vegetation, or water cover that provide permanent wildlife habitat.

After the CRP contract expires, the ASCS cropland base will be protected as long as the farmer keeps the land in grass or under cover.

Program redirection.—The new law allows wetlands contracted into the CRP to be converted to WRP easements. The CRP contract would be terminated, and the farmer would receive payment for the easement. The new program also allows current CRP land planted in grasses to be converted into hardwood trees, windbreaks, shelterbelts, and wildlife corridors. In some instances, 10-year contracts may be converted into 15-year contracts. Under others, the producer would be required to provide an easement for the useful-life of the practice.

Cost-share payments may be made for conversions, where applicable.

Owners and operators converting grasslands to trees must participate in the Forest Stewardship Program.

Discretionary features.—The Secretary of Agriculture, at his discretion, may choose to implement newly legislated aspects of the CRP that affect pasture land eligibility, soil salinity, windbreaks, shelterbelts, sod waterways, trees near riparian areas, and other environmental practices. It is too early to say which of the aspects, if any, the Secretary will choose to implement.

CRP accomplishments 1985–90.—During the first 5 years of the CRP, ASCS received over 443,000 bids and accepted over 333,000 bids. CRP participation is occurring in Puerto Rico and all states, except Arizona, New Hampshire, and Rhode Island. Of almost 34 million acres accepted into the program, about 2.2 million acres were planted to trees.

The rent for all contracted acres totals about $1.7 billion annually, an average rental of about $49 per acre.

A major benefit from the program: It keeps almost 656 million tons of soil from eroding into the nation's streams and rivers annually. In other words, CRP has cut erosion on cropland by over one-fifth. On a per acre basis, the program helped most in New Mexico, where soil loss declined from 44.5 tons per acre per year to 3.0 on CRP acres. The most significant total soil loss reduction can be found in Texas, where loss declined from 37.3 tons per acre to 2.1 tons on 3.9 million CRP acres. This reduces erosion by 138 million tons of soil yearly in Texas.

A summary of the kinds of cover afforded the land is as follows:

Practice	Acres
Tame grass	19,818,403
Native grass	8,121,510
Trees	2,012,805
Wildlife plantings	1,946,915
Already in grass	1,767,440
Already in trees	84,793
Diversions	83,472
Wetland trees	83,229
Filter strips	48,837
Structures	38,017
Waterways	14,960
Wildlife food plots	14,953
Wildlife ponds	12,285
Field windbreaks	6,833

Another benefit that has been hard to gauge has been the savings to ASCS commodity programs as the result of eliminating production on nearly 34 million acres annually. Original estimates were that savings would offset the rental and cost-share payments. This feeling has changed, partly because 2 years of drought occurred within the 1985–90 enrollment period. Drought brought grain out of the loan programs and precluded the entrance of other grain into loan programs, which decreased stocks and increased prices.

Estimates of the net cost of the 34 million acres now enrolled in CRP (CRP payments to farmers less Commodity Credit Corporation (CCC) commodity price and income program outlay reductions attributable to enrollment of base acreage in CRP) will vary as expectations regarding CCC commodity program outlays change. When CCC outlays are high, as they were prior to the 1988 drought, savings due to CRP are high, and the net-cost of CRP is relatively low. But, when CCC payments are low, savings due to CRP are low, and the cost of CRP is relatively higher. The net cost of CRP largely depends on the actual and expected condition of agricultural markets and the subsequent impact on CCC commodity outlays, not on CRP itself.

Based on more recent economic projections, the net cost of the 34-million acre CRP (1985–90) is estimated to be around $8.5 billion. That figure consists of $18.2 billion in projected CRP payments to farmers minus $9.7 billion in projected savings to CCC. These estimates will be subject to revision as current supply-demand conditions and expectations about future conditions change.

Economic research service estimated environmental benefits.—Current research from USDA's Economic Research Service holds that soil productivity benefits due to the prevention of wind and water erosion from the acreage enrolled in CRP are worth an estimated $1.2 billion. Benefits gained from preventing wind erosion are harder to calculate; however, research estimates them at $0.4 billion.

Benefits gained from cleaner streams, rivers, and lakes have been estimated at from $1.3 to $3.9 billion over the life of the program. The economic benefits to ground water were not possible to estimate.

Outdoorsmen and hunters may benefit greatly from CRP because wildlife often use grassy areas close to cropland for nesting, cover, food, and migration corridors. ERS estimates wildlife hunting benefits produced by CRP in a range between $1.9 and $3.1 billion.

New timber growing on CRP lands can add to farmer wealth. Over a 45-year period, CRP will produce 16 billion cubic feet of commercial wood. Assuming that 85% of CRP acreage devoted to trees will be maintained for harvest, the present value of CRP trees is estimated at $3.3 billion.

Wetlands Reserve Program

The 1990 law requires the Secretary of Agriculture to establish a WRP to assist owners of eligible lands in restoring and protecting wetlands. WRP will involve 30-year, or perpetual, or the maximum easement duration allowed under state law. The cropland base of ASCS program purposes will be permanently retired for all land enrolled in the WRP.

ASCS will work with the U.S. Department of the Interior's Fish and Wildlife Service and with state and local agencies on eligibility determinations at both the national and local levels.

Acreage.—To the extent practical, ASCS will enroll 1 million acres in WRP through December 31, 1995. No more than 200,000 acres may be enrolled during 1991,

400,000 through 1992, 600,000 through 1993, and 800,000 through 1994.

Payments.—Payments for easement will be based on the land's fair-market value and be made over a 5- to 20-year period; however, the Secretary may decide to promote perpetual easements by offering lump sum payments. Payments are not to exceed $50,000 per year for nonperpetual easements. There is no limitation on payments for perpetual easements. Cost shares for establishing approved practices on WRP land may range from 50% to 75% on nonperpetual easements or from 75% to 100% of eligible costs on perpetual easements. If an easement agreement is violated, ASCS may require a full refund, with interest, of all payments, but the easement will remain in effect.

The Environmental Easement Program

The new law allows the Secretary of Agriculture to enter into easement agreements with owners of eligible lands to ensure long-term protection of environmentally sensitive lands. Environmental Easement Program easements are perpetual or for the maximum time that state allows, and ASCS crop bases are to be permanently retired from enrolled land. The law allows the Secretary, at his discretion, to enroll lands that are likely to return to agricultural production from the CRP or Water Bank Program and that would damage the environment, if cropped. The law specifies to acreage goal.

Land entering the Environmental Easement Program and the WRP must be owned by the lessor for at least 1 year, unless it was acquired by will or succession, or unless it is determined that the land was not acquired simply for enrollment in the program.

The Agricultural Water Quality Incentives Program

The new law requires the Secretary of Agriculture to establish an agricultural water quality protection program, called the Agricultural Water Quality Incentives Program. Contract acceptance is to begin within 1 year of enactment of the law. Under WQIP, farmers will enter into 3- to 5-year agreements whereby water quality protection plans will be implemented in return for acreage-based incentive payments. Payments are limited to $3,500 per person per year.

The incentive program has a goal of 10 million acres by December 31, 1995, and will feature water quality protection practices that will help producers comply with state and federal environmental laws. It will promote efficient use of pesticides and crop nutrients, and the safe handling and storage of animal waste and agricultural chemicals. There is a wetland and wildlife habitat option in which eligible farmers and ranchers may receive up to $1,500 in cost share for protecting and enhancing wetland or wildlife habitat.

Eligible Land

Lands eligible for incentive payments include critical cropland areas identified in the Clean Water Act, Section 319 plans, wellhead production areas identified under the Safe Drinking Water Act, karst areas with sinkholes, and areas where nonpoint sources of pollution may adversely impact threatened or endangered species habitat. Other areas may be recommended by states, the Environmental Protection Agency, or the U.S. Department of the Interior.

Economics of Livestock and Crop Production on Post-CRP Lands

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Abstract.—Crop and livestock economics, CRP owners, and policy incentives will influence use of CRP grasslands when contracts expire. Key economic factors are trade negotiations, economic reform, food health and safety concerns, and the impact of technology. Adjusting yields and excluding government payments, 1987 Great Plains cattle cash returns would have been larger than grain returns.

Background

The 1985 Food Security Act's Conservation Reserve Program (CRP) added the largest amount to our stock of grasslands of any federal program since the 1930's. By the end of the ninth signup in August 1989, farmers enrolled 34.9 million acres of highly erodible cropland at an average rental rate of $49 per acre, most planted to grass cover. Owners must plant land retired under CRP to permanent cover or trees to reduce erosion. They cannot use the land for grazing, haying, or other economic uses during the 10-year contract except in declared emergencies. The farm's crop base acreage must be reduced in the same ratio as CRP land to total cropland, but is protected until the contract expires.

The CRP contracts will begin to expire in 1996. Contracts will expire in the same order as land was enrolled in CRP, reaching a peak of almost 10 million acres in February 1997. What will happen to lands currently enrolled in the CRP after contracts expire? The fate of CRP land is of increasing concern to farmers and ranchers, government officials with responsibilities for grazing lands, and policy makers who must consider the implications for 1995 farm legislation. This paper examines factors that will influence CRP grassland use after contracts expire. We focus on the Great Plains because a large share of all CRP land and almost all CRP grassland important for range forage issues are found there.

The future of CRP grasslands is a function of three sets of interacting factors: long-term relative economics of crop and livestock production, the characteristics and attitudes of CRP owners and operators, and direct and indirect incentives in existing and proposed agricultural policy.

Long-Term Crop and Livestock Economics

Projected Demand for Crop and Grazing Lands

Under congressional mandate, the federal government assesses resource needs and availability and projects the demand for crop and grazing lands. The USDA Resources Conservation Appraisal (RCA), conducted in 1980 under the influence of tight food supplies and rising export demand, projected U.S. cropland requirements for 2030 at 457 million acres. This was an 11% increase over the 413 million cropland acres inventoried in 1977 (USDA SCS 1981: table 18, p. 70).

Only 5 years later, hopes for increased productivity through technology adoption and the prospect of declining agricultural exports influenced the second RCA to lower projected cropland requirements. Under these assumptions, projected needs for 2030 were 218 million acres, a 48% decline from the 421 million acres of existing cropland inventoried in 1982 (USDA SCS 1987: table 12–5, p. 12–20).

Similar considerations of relative scarcity and surplus influenced the grazing land projections prepared for the 1979 and 1989 Renewable Resources Planning Act (RPA) assessments. Analysts projected derived demand for grazing land to increase to 1.5 billion animal unit months (AUMs) by 2030 in the 1979 assessment. In the 1989 assessment, the projected increase dropped to only 618 million AUMs (USDA FS 1981, p. 179; Joyce 1989, p. 70). Primarily responsible for these large differences in projected demand is a 34% drop in projected U.S. meat consumption (edible weight basis) per capita (Darr 1988, p. 36).

The point is not that the earlier RCA and RPA projections were done badly, but that any such projections are very sensitive to assumptions about exports,

productivity increases, and consumption patterns (Fuglestad and English 1988). The effective demands of larger populations, the responses of other country's agricultural sectors, and changes in trade patterns to meet those demands are important in understanding the fate of CRP land.

Alternative projections of resource demand and supply are beyond the scope of this paper. In view of the uncertainties likely to beset any assessment of future land needs, discussion of factors that will influence the use of CRP land is a more profitable pursuit. Over the next several decades, demographic forces, negotiated changes in the global trading environment, interactions between resources and food producing technologies, and competing demands for energy sources, environmental quality, and resource protection will influence relative demands for crops and livestock products. The reader must judge what the likelihood and relative impact of these factors on resource use may eventually be, but will at least be able to track them as developments occur.

We do not know many of the factors that will ultimately influence landowners' decisions regarding CRP land in 1996. However, there are some emerging forces that will undoubtedly play a role in the decision to crop, graze, or idle CRP land. On domestic markets, changing consumer tastes and concern for healthy diets and food safety are likely to affect underlying demand. Sustainable energy initiatives, some associated with clean air legislation, may be a new source of underlying demand with implications for land use.

On export markets, the Uruguay Round of the General Agreement on Trade and Tariff (GATT) negotiations may change the institutional framework for farm support programs and international trade in agricultural commodities. The unprecedented changes in the centralized economies of eastern Europe and the Soviet Union may be matched by changes of equal potential by 1992 as the western European community moves toward economic integration. The continuing evolution of Japanese, Chinese, and other Pacific rim markets will also be a factor, as will the demands of developing Third World economies. The broader implications of these events can be seen even if none of their impacts can be forecast with certainty. We consider issues for domestic demand first.

Red Meat Consumption

The American Medical Association and American Heart Association advise consumers to reduce their dietary intake of cholesterol and fat, especially from red meats, to reduce the risk of heart disease and colon cancer. Red meats include beef, veal, pork, lamb, and mutton (USDA ERS 1990a). The Food and Drug Administration and National Institutes of Health, in interviews with 4,000 consumers, found that 62% made major changes in their diets to reduce risk of heart disease and cancer. Thirty-six percent reduced intake of red meat (Briggs 1987).

By 1990, red meat consumed per capita in the United States declined 14% from a peak of 157 pounds in 1971 (USDA ERS 1990a). Beef consumption declined faster, dropping 27% from a peak of 94 pounds per capita in 1976 (fig. 1). Data comparability makes demand analysis difficult. Unlike poultry and pork, the beef industry is comprised of fed and nonfed production. Nearly all of the decline in beef consumption has been in nonfed beef. Fed cattle slaughter has ranged from 25 to 26 million head with a slight upward trend for much of the 1980's. This upward trend plus commercial slaughter weights which have risen from about 630 pounds per head in the early 1980's to nearly 680 pounds in 1990 has likely resulted in steady fed beef consumption levels.

Whether this is a change in the demand structure for red meat is controversial. Of 11 studies investigating change in retail meat demand, 7 conclude that some change in the structure of demand for beef and poultry occurred in the late 1970's (Smallwood et al. 1989). Changes in relative prices between red meat and poultry and increasing responsiveness of beef demand to income and price changes account for much of the measured change. No studies make quantitative links to health concerns, convenience demand, increased out-of-home consumption, and other changes that might explain shifts in demand parameters (Buse 1989, Cox et al. 1989, Lee 1989, McCracken 1989, Zafiriou 1989).

Both the 1985 RCA and 1989 RPA assume a constant annual beef, veal, lamb, and mutton consumption of 112 pounds per capita (carcass weight basis) through 2030. However, Blaylock and Smallwood (1986), analyzing demographic and income effects on per capita food consumption expenditures, projected a 39% increase in total food expenditures. Their projections for red meat expenditures did not keep pace, increasing only 15–26% (table 33).

The beef industry has begun to respond to these concerns. Consumer expenditures on beef increased in 1988 following declining expenditures in 1985–87. Additional consumer nutritional information on beef, closer trimmed products, and inelastic demand combined with reduced beef production increased spending on beef. However, the observed decline in red meat consumption over the past two decades, particularly in nonfed beef, offers little support for net increases in forage use

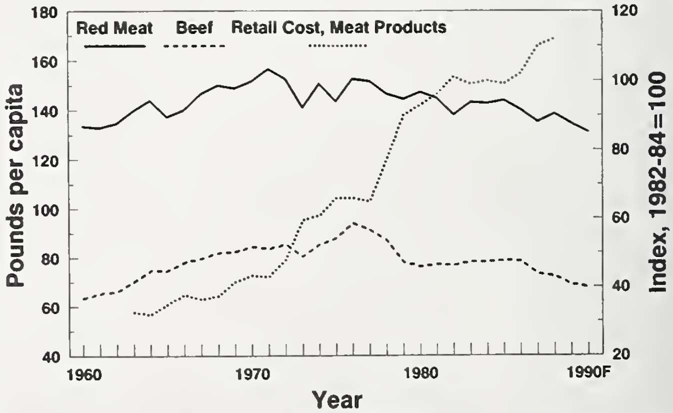

Figure 1.—Trends in Per Capita Consumption Red Meat and Beef, Retail Weight Basis (USDA Economic Research Service).

of CRP land for domestic meat consumption. This is true whether the decline is based on rising beef prices relative to other meats or shift's in the structure of demand due to health concerns.

Food Safety

Concerns over residues from antibiotics given to animals and synthetic biochemicals, such as bovine somatotropin (BST), may also begin to affect consumer demand for meat (Roberts and van Ravenswaay 1989). The European community has already used residues as nontariff barriers to trade, banning imports of meat from animals treated with growth-promoting hormones. This ban led to the loss of a U.S export market worth approximately $92 million, despite expert agreement that methods and products used in U.S. beef are generally safe (Kenney and Fallert 1989). Both the GATT negotiations and EC 1992 market integration plans are considering ways to harmonize food safety regulations to reduce barriers to free trade (Raney and Kelch 1990).

Adoption of BST for beef production would probably have greatest impact on fed cattle, with lesser impacts for cow-calve operations (Kalter and Milligan 1990). Feed efficiency would likely increase, but would require higher protein, higher cost feeds, and fat accretion would likely decrease. Leaner beef may be more marketable, but consumer opposition to hormones may offset any gains. Impacts on grazing land from BST adoption would probably be small, but changes in animal feed requirements would include less feed grain consumption, except soybeans, and less demand for hay and other roughage. Kalter and Milligan (1990) point to immobile resource endowments and excess resource capacity as institutional and economic factors likely to retard adoption of this technology.

Consumers are also concerned about potential health effects from pesticide residues on crops (Roberts and van Ravenswaay 1989). However, recent concern over pesticide residues focuses primarily on fruits and vegetables consumed as raw commodities. The Food and Drug Administration tightly regulates pesticide residues on food and feed grains and oilseeds processed or fed to livestock under the Delaney Clause of the Federal Food, Drug, and Cosmetic Act (FFDCA). It is unlikely that changes in pesticide residue regulations for processed foods would significantly reduce derived demand for land to produce crops likely to be grown on CRP land.

Limits on pesticide and fertilizer use may come about less directly, through concerns about their impacts on surface and ground water quality (McCormick and Algozin 1989). Such limitations, coupled with emphasis on sustainable agricultural systems, could encourage substitution between farm chemicals and cropland through longer crop rotations. This would increase demand for cropland, including land now in CRP.

Under this scenario, conservation compliance requirements for CRP land could be easier to meet than with current production practices since more years of soil-building legume hay in the rotation would reduce soil erosion from more erosive row and close-grown crops. It does not appear that legislators are yet ready to mandate limitations on farm chemicals. Without some legal requirement, there is little economic incentive for most producers to reduce chemical use.

Renewable Energy Sources

Analysts have focused sporadic attention on alternatives to fossil energy sources over the period of recurring energy crises from the early 1970's to the recent Iraq/Kuwait situation. Demand for ethanol from corn or herbaceous biomass feedstocks may increase as a result of stricter air pollution standards in over 30 major U.S. cities under the new Clean Air Act. These cities may have to require 2.7% ethanol or alternative gasoline additives such as ETBE (ethyl-tertiary-butyl ether) to reduce carbon monoxide and ozone emissions. The demand for ethanol-based additives is enhanced by congressional extension of the current $0.60 per gallon tax subsidy for ethanol production beyond its scheduled 1993 expiration. The extension was passed despite critics claims that ethanol's tax breaks are unfair to competing fuel additives (methanol, MTBE), reduce Highway Trust Fund revenues, and are inconsistent with farm program payments some ethanol producers also receive.

McGartland and Shelby (1990) estimated agricultural impacts of increased ethanol production. Air pollution reductions could increase annual ethanol demand 34% to 138% from its current 825-million-gallon level by 1995. If so, an additional 181,000 to 1.2 million acres of corn production would be required. Shifts between crops and regions would likely yield a net increase of 92,000 to 506,000 acres in crop production. If more areas adopted ethanol, demand could increase to 4 billion gallons, a five-fold increase that would require as much as 1.8 million acres of additional cropland. This increase is less than 3% of recent corn plantings, providing little increased demand for cropland.

Production of cellulose-derived ethanol from forage crops could use 12 to 52 million acres of biomass feedstock by 2030 instead of corn, if required technological advances occur (USDOE 1990). If assumptions regarding technical advances, development of energy crops, and cultural techniques prove correct, biomass energy sources for electrical generation, space heating, and liquid fuels could account for 69 to 103 million acres of land. Some of this land may be in woody plant production in the Southeast, but even this demand would indirectly increase demand for forage in the Great Plains to offset resulting losses of forage. Forage-based and corn-based renewable energy scenarios assume that CRP land will be available for crop production if crop prices are to remain stable.

Exports

The 11.7% increase in U.S. exports during the 1970's was a function of rapid growth in real per capita incomes in importing countries, growth in foreign exchange earnings, plentiful credit, import-enhancing agricultural policies of other countries, and a declining dollar. All

of these conditions were reversed from 1981–85. Acreage of crops exported bottomed in 1985 at 81 million acres, after a peak of 129 million acres in 1981 (USDA ERS 1990c). Acreage for export rebounded somewhat since 1985, increasing to 102 million acres in 1989.

The global economic environment for agricultural trade seems poised on the brink of major changes as the 1990's begin. Bilateral trade agreements with Japan promise to increase export markets for livestock and other agricultural products. Multilateral trade negotiations under the GATT could also change the rules for trade and government farm support programs on a broader basis. Dramatic changes in eastern Europe and the Soviet Union could open new markets similar to the earlier economic opening to China. Further economic integration of the European community planned for 1992 will also alter trading patterns.

Changes in export demand implied by these events will have different implications for the use of CRP land depending on the mix of export commodities demanded. Change in the kinds of commodities demanded is a function of growth in per capita income and changes in tastes as incomes rise (Marks and Yetley 1988). For example, if high exports are primarily to less developed countries with low per capita incomes, it is likely that they will focus on wheat, rice, and other commodities for direct human consumption. On the other hand, exports fueled by increases in incomes in more developed countries are more likely to be concentrated in commodities like meat and poultry. This is particularly true for countries with few land resources like Japan, Korea, and Malaysia that are less able to develop sizeable livestock industries of their own through imports of feed grains. While there remain large differences between "eastern" and "western" diets, animal protein consumption appears to be growing as per capita incomes increase (USDA ERS 1990b, p. 14).

U.S. exports of meat (excluding poultry) are small relative to crops, accounting for 6% of the value of total exports in 1989 versus 42% for grains and feeds (USDA ERS 1990f, p. 56). However, meat export quantities have increased steadily since 1977, rising 50%, while exports of grains and feed fell 28% from their peak in 1981 (fig. 2). The 1.14 billion pound increase in beef exports projected under an optimistic scenario in a 1986 study

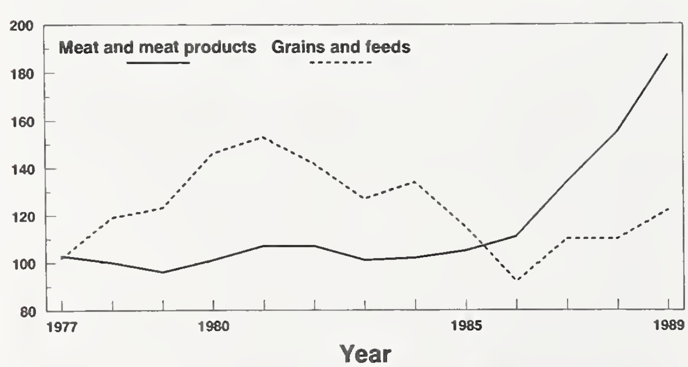

Figure 2.—U.S. Agricultural Exports over 1977–1989 (Quantity index, 1977 = 100) (USDA Economic Research Service).

has already been realized because of increased exports to Japan (Brandt et al. 1989).

Pacific Rim

Three-fourths of 1989 U.S. beef exports were to Japan. The 1988 agreement expanded beef import quotas and eliminates quotas in 1991. Tariffs on beef will increase from 25% to 70% in 1991 and decrease to 50% by 1993, bringing a likely further increase in U.S. beef exports. Potential increases in beef imports after bilateral trade liberalization with Japan range from 270,000 to 842,000 metric tons, 100% to 480% (Coyle 1986).

Japanese beef markets have not yet seen the health-related emphasis on lean beef in American markets, making possible differentiation between longer-fed beef for export and shorter-fed beef for the domestic market (Lin et al. 1989). In other Asian markets, lean beef is preferred and is currently supplied by grass-fed Australian beef. Imports of value-added agricultural products to Japan increased from 20% in 1970 to 45% in 1988 (Coyle 1990). Japanese markets for higher-value and processed livestock products will probably increase as disposable incomes rise and import restrictions are eliminated. Similar developments could occur in more developed Pacific rim countries, such as South Korea, Taiwan, and Malaysia.

Another major Pacific rim destination for U.S. exports is China. Lower incomes and restrictive foreign currency reserves limit Chinese imports of U.S. agricultural products to grains and cotton. Wheat, the major U.S. export to China, was sharply reduced after 1984 and has increased to former levels only since 1987. Population growth and slowing output expansion mean that China will reduce exports and increase imports over time, but these will probably be limited to wheat, feed grains, and cotton, rather than meat (Tuan 1990). The U.S. share of China's wheat imports depends on continuing export subsidies to increase price competitiveness.

GATT Negotiations

More than tariff reductions are at stake in the latest round of multilateral trade negotiations under the General Agreement on Tariffs and Trade. While previous rounds of negotiation were successful at liberalizing trade in manufactured goods, the current effort focuses on nontariff barriers to agricultural trade. The United States and other exporting nations are seeking to eliminate all trade-distorting policies, including domestic price supports and export subsidies (Magiera and Johnson 1990). The objective is to open markets and establish a "level playing field" for competition.

Analyses suggest that liberalizing agricultural trade will increase world commodity prices, increase economic growth, and enhance economic welfare (Dixit et al. 1989). Under more liberal trade terms, short-run U.S. meat production and trade volume should rise. Wheat and coarse grain production and trade will also likely rise as the acreage production program is phased out. However, wheat producers' incomes and asset values

would likely still be below base levels and some land currently in set-aside programs would likely remain idle. Incomes of producers of highly protected or subsidized commodities would likely fall unless governments substitute decoupled income supports for current price supports.

Longer run effects on crops and livestock will vary in direction and magnitude. Partial equilibrium models of more liberal world trade predict declines in U.S. wheat production of 3% to 6%, with declines in the incentive wheat price (market price plus direct government payments) of 11% to 44% (Roningen and Dixit 1989, Tyers and Anderson 1986). However, U.S. wheat production could increase because production costs for many U.S. producers are lower than those in competing countries (Harwood and Bailey 1990). Wheat producers with below average production costs would benefit from increased exports, higher market prices, and higher asset values. These outcomes would not extend to areas of the U.S. with higher production costs, such as the northern and southern Plains. Less productive land for which the unit cost of production is high, including much CRP land in the Plains, would likely not be used for wheat production.

More liberal trade would likely increase U.S. beef production and trade (Hahn et al. 1990). Moreover, higher grain and lower oilseed prices would change feed rations and could result in higher forage use as well (USDA ERS 1990d). Beef output would likely increase in Australia, Brazil, and Argentina. Raw imports to the United States from Brazil and Argentina would continue to be excluded because of trade barriers to control the spread of foot and mouth disease. Japan and the European community would reduce beef production and increase imports. However, bilateral agreements between the United States and Japan mean that U.S. beef exports to Japan will undergo substantial liberalization apart from changes negotiated under GATT.

European Developments

Europe is a focus of much uncertainty about exports because of European community market integration, planned for 1992, and because of recent political and economic reforms in eastern Europe. While successful GATT negotiations could open the EC to increased U.S. beef imports, market integration could increase intra-European trade, reducing U.S. export opportunities. Reform or elimination of the EC agrimonetary system of special exchange rates, national quotas, and plant and animal health and food safety standards could reduce many of the internal barriers to trade between EC countries without lowering barriers to non-EC competition (Gardiner et al. 1990).

Economic reforms in eastern Europe add to the complexity of GATT and EC 1992 export potentials. Agriculture is a larger part of eastern Europe's economy than in the EC and stands to gain more from improvements in yields, mechanization, and farming practices (USDA ERS 1990e). Both East and West are currently net agricultural importers. However, exposure to higher world prices and pressing foreign currency needs could motivate eastern European farmers to greater export production while reducing domestic food consumption. Eastern Europeans could redirect their current meat exports to the USSR toward hard currency earnings in the West. Exports of meat to the West could increase 10% by 2000 and net exports of grain could increase by more than 200% (Cochrane and Koopman 1990).

These projections depend on eastern European countries developing market-based institutions and pursuing convertible currencies that will facilitate increased trade (Urban 1990). The unprecedented reconstruction of economic institutions required will probably go neither quickly nor smoothly, making the timing of agricultural market changes in eastern Europe especially uncertain.

Export Summary

Export demand will probably be the biggest single factor affecting the ultimate fate of CRP land. Most of the conditions that supported export growth in the 1970's changed in the 1980's. However, multilateral and bilateral trade agreements and changes in Pacific Rim, European, and Soviet economies point to new changes that will affect exports in the 1990's.

While it is difficult to foresee all the impacts of these changes, some outcomes are more likely than others. Changes on the Pacific Rim will probably increase U.S. agricultural exports of livestock products to more developed countries like Japan and of food and feed grains to China. Changes in Europe and the Soviet Union will probably reduce U.S. exports in the long run as internal European and East-West barriers to trade come down. Changes stemming from successful GATT negotiations will probably favor U.S. exports of crops and beef in the long run, but may not be favorable to crop producers in higher-cost regions. In areas with large CRP enrollment and a real choice between crop and grazing use, such as the Great Plains, trade liberalization would probably increase beef exports more than crop exports.

Export markets have already improved considerably since the mid-1980's, aided by improved demand, more aggressive U.S. marketing, reduced stocks, and improved productivity. While exports as a percent of total U.S. production have not yet returned to the levels seen in the early 1980's, they could be nearly as large by the time CRP contracts expire. Livestock products are likely to account for a greater share of exports in the 1990's than they did in the 1980's.

Supply of Crop and Grazing Lands

Grazing Lands

On the supply side, there is no lack of forage resources available for U.S. livestock production. Consequently, there is little pressure to keep CRP lands in grass. Total grazing land amounted to 811 million acres in 1987, down 20% since 1950 (Daugherty 1988, 1990). However, most of the decrease occurred in cropland used only for

pasture and grazed forest land. Pasture and range decreased only 6% between 1950 and 1987. Further, much of the decreased pasture and range was in urban regions: the Northeast, Lake States, and Pacific Region. In the regions with the largest amounts of CRP land, pasture and range increased or was unchanged. The southern Plains had a 46% increase in other pasture and range, while the northern Plains recorded an increase since 1969, leaving the regional totals between 1950 and 1987 unchanged.

Grazing supplied on public lands has remained nearly constant at about 20 million AUMs (Joyce 1989, p. 40). Grazing on BLM lands declined from 13 million AUMs in 1969 to 11 million AUMs in 1986. Public land management agencies have responded somewhat to critics who charge that environmental and recreational uses of public grasslands have been slighted in favor of grazing uses. Decreased public grazing could eventually result from recent management changes, including a small increase in public grazing fees. Grazing use of CRP land could eventually substitute for some public forage. How much depends on the location of CRP land in relation to existing public land permittees, ownership or rental arrangements for CRP forage supplies, provision of fencing and water supplies, and the price of CRP forage relative to public grazing fees. Much public grazing land is located in the Mountain States, while most CRP land is in the Great Plains, but there may be limited opportunities for direct substitution in areas where public and private land are in proximity. Where direct substitution is not possible, competition between livestock producers may favor those with access to grazing on post-CRP lands.

The 1989 RPA assessment assumes that all CRP acreage originally in grass and for which the climax type is range will remain as grassland and projects a 47% increase in range productivity by 2030 (Darr 1988 p. 36; Joyce 1989, p. 67, 70). This includes almost all CRP acreage except land in the Northeast and Southeast that could go to trees or wetlands. The 1985 RCA appraisal makes no specific projections of grazing land supply, but the nearly 50% reduction in cropland needed will make some additional land available for grazing use (Joyce 1989, p. 70). At most, CRP could add only 5% to existing forage acreage.

Cropland

Overall, the U.S. cropland base has remained remarkably constant at 400 million acres for much of the postwar period (USDA ERS 1990c). However, only 328 million acres of cropland were used for crops in 1988, down 15% from the peak in 1981. This was due primarily to a record 78 million acres in annual and long-term government idling, including CRP land. Stocks of major program crops were at their lowest levels since the early 1980's through a combination of increased exports, production controls, and the 1988–89 drought. Cropland use rebounded in 1989 to 342 million acres and the 1990 crop may restore depleted stocks. New cropland development in competing countries and productivity increases on existing cropland will influence demands for U.S. cropland currently idled as CRP contracts expire (Phillips and Lu 1987, Purcell 1987).

Technology

Technological advance may reduce the need for U.S. agricultural land resources in two ways: both increasing productivity per acre of U.S. producers and more rapidly increasing productivity of our competitors and former export customers (Phillips and Lu 1987, p. 450; Ruttan 1990; Schuh 1990). The promise of biotechnology is more apparent and immediate for livestock production than for crop production (Barker 1990). Optimistic prospects for bovine and porcine somatotrophin in dairy and hog production are foreseen that could possibly be extended to feedlot beef (Kalter and Milligan 1990, Wagner 1990).

However, few immediate impacts are expected for range livestock because biotech advances in reproduction, progeny selection, and nutrition and feeding require detailed record keeping at the enterprise level that is difficult for range-run animals under current management practices (Sims and Aberle 1990). Gains in production per cow from genetic changes, use of more forage growth before feedlot, and reduced calf slaughter will continue.

Even without biotech advances, changes in livestock technology, including shifts in time on grass and in the feedlot, apparently abetted idling large acreages of pasture and range in the Great Plains. Between 1945 and the peak of the cattle cycle in 1974, pasture and range used per animal declined consistently from 12.7 to 6.5 acres (Daugherty 1988). Pasture and rangeland per cow has rebounded since 1974 as cattle numbers fell, but is still at an historically low 8.3 acres. Any further advances in range technology, including biotech changes, will simply increase our ability to support higher cattle numbers without increased demand on CRP land.

Derived demands for both cropland and grazing land are likely to be less than capacity in the near-term future. Uses for the economically marginal land will likely be outside traditional agriculture, such as the demand for environmental goods like water quality improvement (Purcell 1987). Normal extremes of temperature and precipitation, combined with periodic drought and wind conditions, place much dryland crop production in the Great Plains on the economic margin (Stewart 1990). While proposals for a "Buffalo Commons" are greeted with derision by Great Plains residents, they raise the real possibility that neither crop production nor livestock grazing will be economically valid future uses for CRP lands.

CRP's Future in the Great Plains

The Great Plains Region has been particularly vulnerable to climatic and economic cycles which have affected the relative dominance of crop and livestock production.

Government programs appear to have buffered land use changes that might otherwise have come about as a result of drought and economic conditions. CRP's fate in the Great Plains will become more important as 1990 farm legislation continues the trend toward reduced farm program support for agriculture set in the 1985 Food Security Act. The GATT negotiations, if successful, could also reduce farm support levels for crops important in the Great Plains.

Land Use Trends in the Great Plains

One window to the future is the past. Almost half of CRP land has been enrolled in the Plains States of Texas, Montana, Kansas, North Dakota, Colorado, Nebraska, and Oklahoma. Some of these lands have been retired before under government programs in the 1930's and the 1950's (Helms 1989). Owners returned much of the land retired under earlier programs to crop production as cyclical droughts gave way to more favorable weather and increased groundwater irrigation. However, the government acquired 3.8 million acres in the 1940's and 1950's and these remain in public ownership as national grasslands.

Parallels with the Soil Bank program in the Agricultural Act of 1956 are obvious. Almost 29 million acres were under Soil Bank contract in 1960, but over 80% left the program in the 1970's (Aines 1963; Alig 1980; Bowers et al. 1984, p. 22). More than 80% of Soil Bank land planted to trees remained in that use, but farmers plowed out much of the land planted to grass by the time the export boom of the 1970's occurred. The fate of the Soil Bank shows government conservation programs' vulnerability to high commodity prices. This weakness suggests that owners may put most of the land in the CRP back into crop production after contracts expire if economic conditions warrant, despite conservation compliance requirements.

Government idling of cropland may have retarded land use change that might otherwise have occurred (fig. 3). After 1972, changes in cropland used for crop production corresponded to changes in prices received for crops and were much more variable than changes in

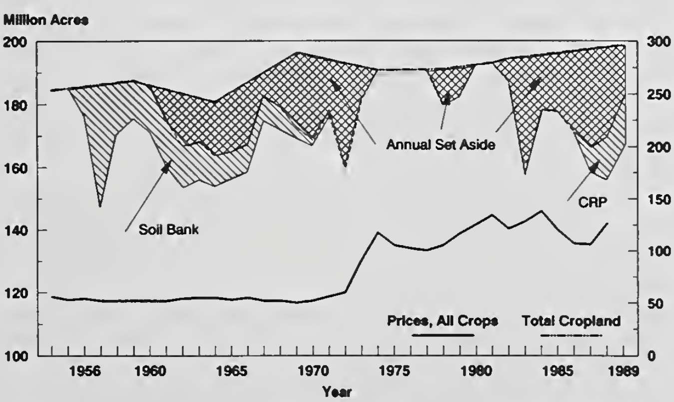

Figure 3.—Cropland and Idled Cropland in the Great Plains States over 1954–1989.

total cropland. Except for brief periods from 1974 to 1977 and 1980 to 1981, government programs idled as much as 20% of Great Plains cropland (25 to 30 million acres). Between 1956 and 1970, much former cropland was in the Soil Bank program. Annual farm program set-aside requirements idled cropland between the mid-1960's and 1985. A combination of annual set-aside and long-term CRP idled large acreages since 1985.

Historically, there is little evidence that either annual or long-term government land idling in the Great Plains ever resulted in permanent changes in agricultural land use. A slow accretion of cropland converted from pasture and range has been accompanied by periodic idling of as much as 30 million acres, most of which is returned to crop production when economic conditions are favorable.

Great Plains Crop and Livestock Economics

The Economic Research Service has prepared enterprise budgets for wheat and cow-calf operations since the early 1970's (McElroy et al. 1989, Shapouri et al. 1990). Budgeted net returns from wheat production in the Great Plains have been similar to returns for cow-calf enterprises adjusted to a per-acre basis, excluding direct government payments and accounting for fallowed land (fig. 4). Wheat net cash income per acre was higher than cow-calf net cash income per acre from 1975 to 1985, but was lower for 1986 and 1987. However, wheat net returns to owned inputs (including general overhead, taxes, insurance, and capital replacement, but excluding interest) were higher than for cow-calf operations only in 1975, 1979, and 1983. While average net cash returns per acre were higher for wheat than beef ($17.51 versus $4.11), average returns to owned inputs were higher per acre for beef ($3.02 versus –$1.26). Wheat returns per acre were more variable than cow-calf returns (C.V. –1,126.3 versus 179.5).

While useful for comparisons over time, ERS regional budgets do not provide detail on geographic variation. State-level aggregate receipts, production expenditures and net cash returns are available for 1987 from the Census of Agriculture for cash grain (SIC 011), cotton (SIC 0131), and beef cattle, except feedlot (SIC 0212) farms (table 1). Averaged across all states, both cash grain and cotton farms in the Great Plains earned higher cash returns per acre than beef cattle. However, when government payments are excluded, cattle returns are higher than cash grain returns in North Dakota and Kansas and are almost equal to those for grain farms in Oklahoma.

A Sensitivity Analysis

Based on these average returns, one could conclude that few acres of CRP land would remain as grazing land after contracts expire, given current levels of government price and income support. However, CRP acres enrolled are not of "average" productivity, either for crop or for grazing use. Also, the thrust of recent farm policy, driven

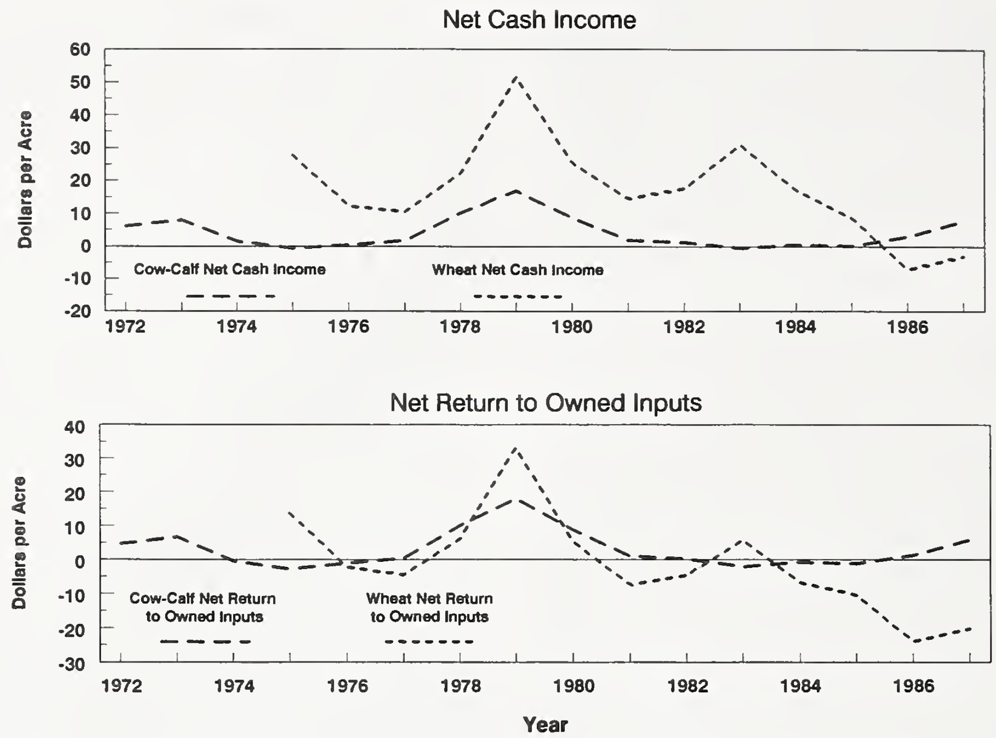

Figure 4.—Comparative Cow-Calf/Wheat Economics in the Great Plains over 1972–1987 (USDA Economic Research Service).

by the federal budget deficit, and of trade liberalization negotiations under GATT is reduce levels of government price and income support. If adjustments are made for the productivity of CRP land and possible reductions in government payments, how much change in relative crop and livestock prices or government support would be required to make grazing competitive with crop production?

In general, highly erodible land is no less productive for crop use than other cropland (Heimlich 1989). Because CRP rental bid caps were set near the average rental rates for all land, farmers enrolled the highly erodible land least productive for crops. State average wheat yields for base acres enrolled in CRP are 53% to 93% of average wheat yields for all cropland in each state. CRP cotton yields are 60% to 69% of average cotton yields. However, since CRP land was used for crop production instead of other, presumably less productive, range and pasture, it is likely to have above average forage productivity unless crop use has dramatically decreased soil organic matter.

Reducing cash grain and cotton farm receipts and government payments per acre based on the ratio of CRP base acre to overall average crop yields reduces returns for crop production relative to livestock production (table 1). Forage yields were not increased to account for CRP lands' assumed higher productivity because no data on CRP forage yield is available and CRP land would probably be a small part of total range supporting a cattle operation.

Excluding government payments, yield-adjusted returns per acre for cash grain farms are less than beef returns in all states and are negative in North Dakota, South Dakota, Wyoming, Colorado, New Mexico, and Texas. Yield-adjusted cotton returns per acre, excluding government payments, are higher than beef returns in New Mexico, but are less than beef returns in Oklahoma and Texas.

Conditions for livestock production vary within Great Plains States more than these state-wide averages show. Reduced precipitation west of the 100th meridian in Great Plains States may limit transition to grazing use on CRP land because stocking factors, and therefore livestock revenue per acre, would be lower than those of more humid areas in eastern parts of the state. Lack of forage in dryer parts of the year restricts herds, even though ample forage may be available during some seasons. While wheat yields are also likely to be limited by lower precipitation, fallowing and moisture-conserving tillage practices may make production possible.

On average for the Great Plains, revenues from grain sales and government payments would have to fall 14.8% from 1987 levels for beef returns to equal returns for cash grain production on CRP land. Various analysts project declines of 11% to 44% in incentive prices (including government payments) for the United States under GATT multilateral policy reform (Harwood and Bailey 1990). Cotton prices would have to fall an average of 12% for returns to cotton production on CRP land to equal beef returns.

Table 1.—Returns to crop and livestock enterprises per acre, Great Plains states, 1987.

Farm type	ND	SD	MT	WY	NE	KS	CO	OK	NM	TX	Great Plains
	Dollars per acre										
Beef cattle, except feedlots (SIC 0212)											
Total sales	63.17	51.18	23.19	18.49	53.55	135.53	33.32	78.76	11.48	34.80	37.99
Production expenditures	50.98	40.85	18.62	14.29	42.77	116.87	27.59	69.47	9.49	31.44	32.40
Net cash return	12.63	10.68	4.56	4.02	11.52	20.17	4.88	6.72	2.01	3.12	5.41
Government payments	7.17	3.88	1.29	0.26	3.45	10.49	1.75	5.32	0.53	1.45	2.22
Net cash return + payments	19.80	14.57	5.85	4.29	14.96	30.65	6.63	12.04	2.54	4.57	7.63
Cash grain (SIC 011)											
Total sales	61.09	76.84	76.84	76.84	137.36	71.63	66.96	59.07	64.81	96.80	82.00
Production expenditures	54.88	61.53	61.53	61.53	106.54	55.90	55.87	54.72	57.11	82.50	67.23
Net cash return	6.21	15.31	15.31	15.31	30.82	15.73	11.09	4.35	7.70	14.30	14.77
Government payments	19.10	19.48	19.48	19.48	36.88	19.88	20.13	19.95	26.20	27.07	23.26
Net cash return + payments	25.31	34.79	34.79	34.79	67.70	35.61	31.22	24.30	33.90	41.36	38.03
With CRP yield reduction											
CRP yield (percent)[1]	81.40	72.80	77.60	72.80	75.00	81.10	63.00	92.60	53.10	78.60	78.00
Reduced total sales	50.99	60.16	63.10	60.16	108.62	60.37	46.00	55.65	41.55	79.82	66.88
Reduced net cash return	–3.89	–1.37	1.57	–1.37	2.09	4.47	–9.86	0.93	–15.56	–2.68	–0.35
Reduced government payments	15.55	14.18	15.11	14.18	27.66	16.12	12.68	18.48	13.91	21.27	18.14
Reduced return + payments	11.66	12.81	16.69	12.81	29.75	20.59	2.82	19.40	(1.65)	18.60	17.79
Price change[2]	15.00	2.90	–17.70	–13.90	–12.90	16.90	6.70	–15.90	8.50	–17.70	–14.80
Cotton (SIC 0131)											
Total sales								114.80	257.78	143.14	142.55
Production expenditures								82.35	158.83	93.70	93.69
Net cash return								32.45	98.95	49.44	48.85
Government payments								27.94	34.66	32.38	32.10
Net cash return + payments								60.39	133.60	81.82	80.95
With CRP yield reduction											
CRP yield (percent)[1]								68.90	60.50	60.10	60.50
Reduced total sales								88.74	181.26	95.58	96.08
Reduced net cash return								6.39	22.43	1.8	72.38
Reduced government payments								19.25	20.97	19.46	19.42
Reduced return + payments								25.64	43.39	21.33	21.80
Price change[2]								–16.20	–21.10	–14.10	–12.00

[1]*Ratio of average yield on base acreage enrolled in CRP to state average wheat yield.*
[2]*Percent change in crop price needed to equate crop and cattle net cash returns + government payments.*
Source: Census of Agriculture, 1987.

Characteristics of CRP Land Operators

The characteristics of the land and the characteristics of the people who own and manage it will obviously be important factors influencing the fate of CRP land after contracts expire. Within any economic and policy environment prevailing when contracts expire, it is likely that some owners on some CRP land will be disposed to return the land to crop production and that others will be more likely to keep the land in grass.

We previously estimated that landowners would likely retain 15% to 30% of CRP land in grass after contracts expire. We based our estimate on an extrapolation of operator characteristics associated with expectations for use of CRP land from a sample of Daviess County, Missouri, farmers (Heimlich and Kula 1989). Predominant enterprise (livestock or crop), average gross sales of agricultural products, the opportunity cost of idling crop base acreage, and the cost of conservation compliance were key variables explaining differences in expected use of CRP land.

The probability that a landowner intended to retain CRP land in grass decreased from 90% for livestock farms with less than $20,000 in sales and no base acreage to only 3% for crop farms selling more than $200,000 with high base acreage. The probability of keeping land in grass was 7% to 28% higher for livestock than for cash-crop farmers, decreasing as sales increased. At the mean levels of the variables, livestock farmers had a 77% estimated probability of retaining CRP land in grass, while the probability for crop farmers was only 44%.

The 1987 Census of Agriculture reported on almost 75% of CRP land idled by 1987 (table 2). Livestock farms, including dairy, animal specialties, and general livestock farms, accounted for 28% of CRP acreage idled in 1987. Although 64% of acres enrolled by the end of 1987 were crop base acres, farmers who participated in annual acreage reduction programs (ARP) operated only 40% of CRP acres reported in the Census. Almost one-third received Commodity Credit Corporation loans. More than 30% of CRP acres were operated by farmers who sold less than $20,000 in 1987 or who where excluded from the census based on lack of sales. Only 8% of CRP operators had more than $250,000 in annual sales.

These data suggest that farmers with characteristics favoring long-term retention of the land in grass

Table 2.—CRP acres by owner characteristics, 1987.

	Farms	Acres	Percent of acres
By farm type			
Crop farm	37,422	5,521,208	35.1
Livestock farm	28,683	4,349,461	27.7
Unknown[1]	na	5,842,010	37.2
By program participation			
ARP	39,737	6,171,585	39.3
CCC loans	22,837	3,203,364	20.4
Unknown[1]	na	5,842,010	37.2
By Sales			
$1,000,000 or more	393	162,427	1.0
$500,000–999,999	921	292,677	1.9
$250,000–499,999	2,833	690,089	4.4
$100,000–249,999	9,586	1,887,956	12.0
$50,000–99,999	10,001	1,789,075	11.4
$20,000–49,999	12,484	1,828,528	11.6
$10,000–19,999	8,636	1,032,588	6.6
Less than $10,000[2]	36,102	3,968,289	25.3
Unknown[3]	na	4,061,050	25.8
By occupation			
Farming	44,680	7,690,398	48.9
Other[2]	36,006	3,961,23	125.2
Unknown[3]	na	4,061,050	25.8
By tenure			
Full owner operators	32,521	3,808,797	24.2
Full owner nonoperators[2]	14,581	1,780,960	11.3
Part owner operators	28,409	5,197,699	33.1
Tenants	5,175	864,173	5.5
Unknown[3]	na	4,061,050	25.8
By census coverage			
Census farms	66,105	9,870,669	62.8
Noncensus farms	14,581	1,780,960	11.3
Subtotal	80,686	11,651,629	74.2
Not counted	na	4,061,050	25.8
Total idled in 1987	na	15,712,679	100.0

[1]*Includes agricultural places excluded by the census farm definition with acres in the CRP and CRP acres not accounted for in the Census of Agriculture.*
[2]*Includes agricultural places excluded by the census farm definition with acres in the CRP.*
[3]*Includes CRP acres not accounted for in the census of Agriculture.*

Source: Census of Agriculture, 1987.

operate relatively few CRP acres. Adding to the uncertainty is the large proportion of CRP land at least temporarily disassociated from farming. Between 25% and 50% of CRP acres idled in 1987 were owned by people who were not identifiable as farm operators, because they either ceased active farming or were not accounted for in the Census of Agriculture. Individuals with a nonfarm principal occupation owned about half the CRP land, and only 63% was part of a farm.

The partial budget analysis discussed above does not reflect capital costs for fencing and watering areas that will be required to use CRP land for livestock production. Mixed livestock and crop farms will be in a better position to develop livestock enterprises than farms specializing in crop production.

Perhaps more important than these capital costs are the requirements for human capital needed to make a transition from cropping to livestock production. Many CRP landowners do not have experience in raising livestock and may be unwilling or unable to learn these new skills. However, given appropriate economic incentives, properly functioning land markets, and barring institutional barriers, land best suited to grazing will be leased or sold to producers who can pursue livestock enterprises.

Policy Changes in the 1990 Farm Bill

Provisions in 1990 farm legislation passed in the Senate (S. 2830) and House (H.R. 3950) affect the terms which CRP landowners will face when contracts begin to expire. While there are more options available to owners to keep CRP land out of intensive crop production,

few of those options lend themselves to grazing use of CRP land.

The first option is not in the farm bill conservation title, but in commodity provisions. It allows operators to protect up to 25% of their crop acreage base while planting it to other crops. Producers could use this provision to move from program crop production to forage crops or grazing, but farmers will more likely use it to enhance flexibility in planting decisions for program crops and soybeans. The bills establish an integrated crop management program to protect crop acreage base planted to legumes and other soil and water conserving crops, including livestock production systems. However, farmers cannot receive government payments if they hay or graze the land, limiting this option for livestock production. Another commodity provision that may affect CRP land requires the Secretary to allow haying and grazing of land set aside in the annual or multiyear programs, if requested.

Target prices in the 1990 legislation can be frozen at 1990 levels and program yields remain frozen at 1985 levels. Assuming technological increases in yields and higher market prices, these provisions reduce the amount of government support for program crop production. Reduced government payments should reduce net returns for program crop production on CRP land, in relation to returns for livestock production.

The Grazing Lands Forum noted that a major disincentive to retaining CRP grassland in the 1985 Food Security Act was loss of crop acreage base if the farmer did not plant when the contract expired (Heimlich et al. 1989). In House and Senate farm bill conservation titles, crop acreage base is protected for an additional 10 years if the farmer maintains conservation cover. Limited haying and grazing is allowed under this provision. The Senate requires USDA to study CRP land subject to expiring contracts and report findings and recommendations by the end of 1993. This extension could defer some landowners' decisions regarding CRP land for another 10 years. Ultimately, however, these owners must still choose between crop acreage base and permanent grassland.

The bills extend CRP contract life to 15 years for some purposes, including tree planting, windbreaks, and shelterbelts, and extends restored wetlands to permanent easements. While some grazing use could be made of these lands, most CRP grassland is still limited to 10 year contracts.

The 1990 bills tighten conservation compliance, requiring new or revised plans to reduce erosion at least 50% in the House and to meet T values on new CRP enrollments in the Senate. CRP owners would have 2 years to implement plans after contracts expire.

Conclusions

Fundamental economic trends do not indicate clearly whether CRP land will be needed for either crop or livestock production. Both crop and livestock production seem poised for expansion in the 1990's. However, existing supplies of cropland and grazing land are adequate to meet that expansion, particularly if productivity increases associated with new technology materialize. Key economic factors are the growth and nature of world demand, subject to trade negotiations, economic reforms, and food health and safety concerns, and the impact of technology on U.S. and world cropland productivity.

In the Great Plains, annual and long-term government land idling programs have kept land in crop use. Excluding government payments, returns to owned inputs per acre for cow-calf enterprises over the last 15 years have been similar to returns for wheat production. Adjusting for lower yields on CRP land and excluding government payments, net cash returns for cattle on CRP land in 1987 would have been larger than returns for grain production.

Reductions in either grain prices or government payments averaging about 15% would equate cattle returns to yield-adjusted grain returns. Marginal, high-cost producers in the Great Plains could find the choice between livestock and crop production difficult to make if GATT negotiations and other pressures to reduce government farm supports are successful.

In general, 1990 farm legislation has deferred policy making for CRP land coming out of contracts to 1995. Extending base protection for an additional 10 years removes the most immediate policy incentive to bring CRP land back into production, but does not resolve CRP landowners' ultimate choice between base acreage and permanent grassland. Moreover, grazing land contract length remains at 10 years and opportunities for grazing use to promote a transition to livestock production prior to expiration remain limited. Domestic agricultural policy has been made at least neutral with regard to the ultimate fate of CRP land. Unless major new resource protection provisions are enacted in 1995 or as a response to GATT outcomes, CRP landowners will make their land use decisions on the basis of relative crop and livestock economics, tempered by the global trade environment, existing farm enterprises, and their own preferences and needs.

Literature Cited

Aines, Ronald O. 1963. Release of land from Conservation Reserve contracts. AER-34. Economic Research Service, U.S. Department of Agriculture.

Alig, R. J.; Mills, T. J.; Shackelford, R. J. 1980. Most soil bank plantings in the South have been retained; some need follow-up treatment. Southern Journal of Applied Forestry. 4: 0–64.

Barker, Randolph. 1990. Impact of prospective new technologies on crop productivity: implications for domestic and world agriculture. In: Technology and Agricultural Policy. Washington, DC: National Academy Press: 47–62.

Blaylock, J. R.; Smallwood, D. M. 1986. U.S. demand for food: household expenditures, demographics, and projections. TB-1713. U.S. Department of Agriculture, Economic Research Service.

Brandt, Jon A.; Young, Robert E., II; Alam, Shamsul; Womack, Abner V. 1989. Foreign trade and its impact on the domestic livestock market. In: Buse, R. C., ed. The economics of meat demand. Madison, WI: University of Wisconsin: 307–327.

Briggs, G. M. 1987. The red meat controversy. Science of Food and Agriculture 5: 2–8.

Buse, Rueben C. 1989. What is America eating and what is happening to meat consumption? In: Buse, R. C., ed. The economics of meat demand. Madison, WI: University of Wisconsin: 18–56.

Cochrane, Nancy; Koopman, Robert. 1990. Eastern Europe: the transition from plan to market. World Agriculture Situation and Outlook report, special issue: forces for change in the 1990's. WAS-59. U.S. Department of Agriculture, Economic Research Service: 33–37.

Cox, Thomas A.; Buse, Rueben C.; Alvarez, Antonio. 1989. Effect of demographics on changes in at-home meat consumption. In: Buse, R. C., ed. The economics of meat demand. Madison, WI: University of Wisconsin: 217–242.

Coyle, William T. 1986. The 1984 U.S.-Japan beef and citrus understanding: an evaluation. FAER-222. U.S. Department of Agriculture, Economic Research Service.

Coyle, William. 1990. The changing structure of Japanese agricultural trade. World Agriculture Situation and Outlook report, special issue: forces for change in the 1990's. WAS-59. U.S. Department of Agriculture, Economic Research Service: 49–55.

Darr, D. R. 1988. The 1989 RPA assessment of the forest and range land situation in the United States. Technical document supporting the 1989 Resource Planning Act Assessment. Public review draft. U.S. Department of Agriculture, Forest Service.

Daugherty, A. B. 1988. U.S. grazing lands: 1950–82. SB-771. U.S. Department of Agriculture, Economic Research Service.

Daugherty, A. B. 1990. Major uses of land in the United States: 1987. U.S. Department of Agriculture, Economic Research Service. [In prep.]

Dixit, Praveen M.; Herlihy, Michael T.; Magiera Stephen L. 1989. Global implications of agricultural trade liberalization. In: Agricultural-food policy review: U.S. agricultural policies in a changing world. AER-620. U.S. Department of Agriculture, Economic Research Service: 253–274.

Fuglestad P.; English, B. C. 1988. Is policy analysis related to policy? American Journal of Agricultural Economics (abstract) p. 1200. Knoxville, TN: American 1988 Annual Meeting, Agricultural Economics Association.

Gardiner, Walter; Neff, Steve; Kelch, David. 1990. EC 1992: economic integration and world trade effects. World Agriculture Situation and Outlook report, special issue: forces for change in the 1990's. WAS-59. U.S. Department of Agriculture, Economic Research Service: 8–14.

Hahn, William F.; Crawford, Terry L.; Bailey, Linda; Shagam, Shayle. 1990. The world beef market: government intervention and multilateral policy reform. Staff Rep. No. AGES9051. U.S. Department of Agriculture, Economic Research Service.

Harwood, Joy L.; Bailey, Kenneth W. 1990. The world wheat market: government intervention and multilateral policy reform. Staff Rep. No. AGES9007. U.S. Department of Agriculture, Economic Research Service.

Heimlich, R. E. 1989. Productivity and erodibility of U.S. cropland. AER-604. U.S. Department of Agriculture, Economic Research Service.

Heimlich, R. E.; Kula, O. E. 1989. Grazing lands: how much CRP land will remain in grass? Rangelands. 11(6): 253–257.

Heimlich, R. E.; Wrona, J.; Fleder, S.; Krupa, K.; Schwein, J.; Smith, P. 1989. Grazing lands and the conservation reserve program. Harpers Ferry, WV: Grazing Lands Forum, Third Forum.

Helms, D. 1989. New authorities and new roles: SCS and the 1985 farm bill. In: Schnepf, M., ed. Implementing the Food Security Act of 1985. Ankeny, IA: Soil and Water Conservation Society.

Joyce, L. A. 1989. An analysis of the range forage situation in the United States: 1989–2040: technical document supporting the 1989 USDA Forest Service RPA assessment. Gen. Tech. Rep. RM-180. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 136 p.

Kalter, Robert J.; Milligan, Robert A. 1990. Emerging agricultural technologies: economic and policy implications for agricultural production. In: Technology and agricultural policy. Washington, DC: National Academy Press: 79–96.

Kenney, Jeannine; Fallert, Dick. 1989. Livestock hormones in the United States. National Food Review. 12(3): 21–24.

Lee, Jonq-Ying. 1989. Effect of sociodemographics on at-home red meat consumption in the United States. In: Buse, R. C., ed. The economics of meat demand. Madison, WI: University of Wisconsin: 243–255.

Lin, B. H.; Mori, H.; Gorman, W. D.; Rimbey, N. R. 1989. An analysis of the Japanese demand for beef and some implications of the 1988 U.S.-Japanese beef agreement: papers of the 1989 Annual Meeting; 1989 July 9–12; Coeur d'Alene, ID. Western Agricultural Economics Association: 559–566.

Magiera, S. L.; Johnson, M. 1990. Dynamics of trade negotiations. World Agriculture Situation and Outlook report, special issue: forces for change in the 1990's. WAS-59. U.S. Department of Agriculture, Economic Research Service: 4–7.

Marks, S. M.; Yetley, M. J. 1988. The impact of economic development on global food demand patterns. In: Third World agriculture and U.S. agriculture interests. World Agriculture Situation and Outlook report reprint. U.S. Department of Agriculture, Economic Research Service: 29–32.

McCormick, Ian; Algozin, Kenneth A. 1989. Planting flexibility: implications for groundwater protection? Journal of Soil and Water Conservation. 44(5): 379–383.

McCracken, Vicki A. 1989. The importance of demographic variables on the probability of consuming meat away from home. In: Buse, R. C., ed. The economics of meat demand. Madison, WI: University of Wisconsin: 256–283.

McElroy, Robert; Ali, Mir; Dismukes, Robert; Clauson, Annette. 1989. Costs of production for major U.S. crops, 1975–87. Staff Rep. No. AGES8922. U.S. Department of Agriculture, Economic Research Service.

McGartland, Al; Shelby, Michael. 1990. The contribution of economic analysis to integrated environmental management: a case study. Presented at: Is environmental quality good for business? Problems and prospects in the agricultural, energy, and chemical industries.; 1990 June 11–12; Washington DC. American Enterprise Institute for Public Policy Research.

Phillips, M. J.; Lu, Y. C. 1987. Impacts of emerging technologies on agricultural productive capacity of the United States and the world. American Journal of Agricultural Economics. 69(2): 448–453.

Purcell, J. C. 1987. Optional uses for excess resources in U.S. agriculture. American Journal of Agricultural Economics. 69(2):4 54–458.

Raney, Terri; Kelch, David. 1990. The safe food issue: new nontariff barriers? World Agriculture Situation and Outlook report, special issue: forces for change in the 1990's. WAS-59. U.S. Department of Agriculture, Economic Research Service: 28–32.

Roberts, Tanya; van Ravenswaay, Eileen. 1989. Effects of new scientific knowledge on food safety policy. In: Agricultural-food policy review: U.S. agricultural policies in a changing world. AER-620. U.S. Department of Agriculture, Economic Research Service: 315–332.

Ronigen, Vernon O.; Dixit, Praveen M. 1989. Economic implications of agricultural policy reform in industrial market economies. Staff Rep. No. AGES89–36. U.S. Department of Agriculture, Economic Research Service.

Ruttan, Vernon W. 1990. Implications of technical change for international relations in agriculture. In: Technology and agricultural policy. Washington, DC: National Academy Press: 229–245.

Schuh, G. Edward. 1990. Technical change: sources of income and agricultural production in developing countries. In: Technology and agricultural policy. Washington, DC: National Academy Press: 185–212.

Shapouri, Hosein; Bowe, Russell; Crawford, Terry; Jessee, Warren. 1990. Costs of producing U.S. livestock, 1972–87: estimating and methodology update. AER-632. U.S. Department of Agriculture, Economic Research Service.

Sims, Philip; Aberle, Elton. 1990. Current and future technology in ranching and livestock production. In: Environmental issues and rangeland. Report of the Great Plains Range and Livestock Committee; 1990, June 4–7; Tulsa, OK. Great Plains Agricultural Council. [Unpublished]

Smallwood, David M.; Haidacher, Richard C.; Blaylock, James R. 1989. A review of the research literature on meat demand. In: Buse, R. C., ed. The economics of meat demand. Madison, WI: University of Wisconsin: 93–124.

Stewart, B. A. 1990. Limits, bounds, and future of conservation tillage in the Great Plains. In: Conservation tillage: proceedings of the Great Plains tillage symposium. GPAC Bull. 131: 1–13.

Tuan, Francis C. 1990. China's agriculture and trade: development and prospects. World Agriculture Situation and Outlook report, special issue: forces for change in the 1990's. WAS-59. U.S. Department of Agriculture, Economic Research Service: 43–48.

Tyer, Rodney; Anderson, Kim. 1986. Liberalizing OECD agricultural policies: effects on trade and welfare. Working papers in Trade and Development No. 87/10. Australian National University.

U.S. Department of Agriculture, Economic Research Service. 1990a. Livestock and Poultry Situation and Outlook Report. LPS-42.

U.S. Department of Agriculture, Economic Research Service. 1990b. Pacific Rim Agriculture and Trade Report. RS-90–2.

U.S. Department of Agriculture, Economic Research Service. 1990c. Agricultural Resources, Cropland, Water, and Conservation Situation and Outlook Report. AR-20.

U.S. Department of Agriculture, Economic Research Service. 1990d. Liberalizing world trade in meats. Agricultural Outlook. AO-161: 30–35.

U.S. Department of Agriculture, Economic Research Service. 1990e. Europe in turmoil. Agricultural Outlook. AO-163: 28–33.

U.S. Department of Agriculture, Economic Research Service. 1990f. Table 30—U.S. agricultural exports and imports. Agricultural Outlook. AO-165: 56.

U.S. Department of Agriculture, Forest Service. 1981. An assessment of the forest and rangeland situation in the United States. FRR-22.

U.S. Department of Agriculture, Soil Conservation Service. 1981. 1980 appraisal, soil, water, and related resources in the United States: status, condition and trends (Part I) and Analysis of resource trends (Part II).

U.S. Department of Agriculture, Soil Conservation Service. 1987. The second RCA appraisal: soil, water, and related resources on nonfederal land in the United States. Analysis of condition and trends. Public review draft.

U.S. Department of Energy, Office of Policy, Planning and Analysis. 1990. The potential of renewable energy: An interlaboratory white paper. SERI/TP-260–3674. Golden, CO: Solar Energy Research Institute.

Urban, Francis. 1990. Currency convertibility in eastern Europe and the USSR: issues, effects, and prospects. World Agriculture Situation and Outlook report, special issue: forces for change in the 1990's. WAS-59. U.S. Department of Agriculture, Economic Research Service: 61–66.

Wagner, Thomas E. 1990. The present and future roles of biotechnology in animal production. In: Technology and agricultural policy. Washington, DC: National Academy Press: 63–71.

Zafiriou, Margaret. 1989. The Canadian experience with lean beef. In: Buse, R. C., ed. The economics of meat demand. Madison, WI: University of Wisconsin: 346–358.

Landowner Options When CRP Ends

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Abstract.—Landowners with Conservation Reserve Program contracts have many options for use of the land once contracts expire. Included are the guaranteed rights to plow out the grass, retain the grass cover, or convert to nonagricultural uses. One attractive alternative would be to extend current contracts; however, easements longer than 15 years would not be popular. Many factors will impact option selection, principally economics.

Introduction

The 1985 Food Security Act provided an excellent opportunity for farmers to retire highly erodible croplands for a 10-year period through the Conservation Reserve Program (CRP). The 1990 Farm Bill continued the CRP and made additional lands eligible. CRP came on the heels of several poor crop years in several parts of the country. Many farmers, landowners, and bankers viewed the CRP as an opportunity to assure a stable income from a portion of the cropland on a farm for the duration of the contract. Some farmers viewed CRP as an opportunity to remove highly erodible cropland from row crop production permanently. Other farmers took advantage of the program to retire from farming. A wide variety of factors were involved in decision making regarding contracting land into the CRP (Nowak and Schnepf 1989).

CRP has generated considerable environmental benefits, while causing a number of concerns (Harris et al. 1989). Preliminary results of a national survey of CRP contract holders by the Soil and Water Conservation Society staff (M. Schnepf 1990, personal communication) have revealed that more than half (54%) of the producers have not made final plans for CRP acreage following contract expiration. Further, of those that have decided what to do with their CRP lands, more than 40% plan to convert the acreage to croplands and about 30% to 35% expect to retain the grass cover for grazing or hay production. About 60% of producers indicated that economics will be the most important factor in decision making regarding post-CRP land use.

Program Definition and Guarantees

In addition to annual rental payments and cost-share assistance for establishing the required cover of grass or trees, farmers were assured by USDA that the CRP land would be treated exactly the same as adjacent land not bid into the CRP upon contract expiration. In addition, commodity bases would be preserved and the land would be subject to the same conservation regulations as similar lands. That guarantee included assurance that the CRP land would not be subject to more strenuous conservation requirements than if used to produce crops, which means that where applicable the CRP land would be subject to conservation compliance regulations just like adjacent properties, instead of sodbuster regulations. Based on those guarantees, farmers evaluated both short-term and long-term implications, including options for using the lands once contracts expire, and decided whether to submit a bid.

Options Following Contract Expiration

Discussions with personnel of the Soil Conservation Service, Agricultural Stabilization and Conservation Service, and Extension Service, in addition to discussions with producers with CRP contracts, revealed a number of options available to producers once the CRP contracts expire. This discussion primarily will be limited to those farmers with established grass covers, rather than those with established trees. It also will deal primarily with the extensive areas of croplands, rather than narrow strips along drainageways, windbreaks, shelterbreaks, saline lands, or other unique areas. Following is a listing of several options landowners expect to be available when their CRP contracts expire:

1. The principal option farmers expect to be available after the 10-year contract period is to be allowed to plow out the grass and convert the land back into row crop production, utilizing conventional tillage practices. Many farmers anticipate the use of some type of primary

inversion tillage to remove the existing vegetation, followed by various land preparation practices which will stimulate decomposition of the grass to foster suitable seedbed preparation. Of course, since much of these lands will be subject to conservation compliance, farmers expect to utilize appropriate conservation practices to control erosion. However, some unknowns still exist in that regard. At the present time, farmers are uncertain when necessary conservation practices must be in place relative to plow-out of the CRP cover and the planting of commodity crops. For example, if terraces, grassed waterways, or other structures are required on a farm, the total period of time that the farmer will be allowed to establish such practices and the exact date of completion relative to contract expiration and planting of the desired commodity crop are not currently known.

In spite of the uncertainties, this option likely will be the most popular in many sections of the United States, principally because of economic incentives. It is anticipated that 60% to 70% of producers will select this option, assuming that contract extension is not a viable or attractive option. However, changes in present farm program policies could alter those plans.

2. A similar option will be for farmers to develop a conservation tillage type of production system in which they convert the CRP grassed areas into crop production utilizing no-till or similar practices. Such production system selections will extend the benefits of the grass cover. However, in many areas of extensive CRP acreage, no-till production systems are not popular, and necessary labeled herbicides are not available currently to permit selection of this option. Additional research by USDA and the agrichemical industry could create additional interest in this option by bringing new chemicals onto the market ahead of contract expirations. Less than 10% of producers with CRP contracts are expected to select this option.

3. Another major option available to farmers will be to leave the grass in place and establish a grazing and/or haying operation on those lands. It is estimated that 20% to 40% of CRP acreage will be managed in this manner. In many cases, selecting this option will require establishment of appropriate fencing, livestock water supplies, and other practices necessary to facilitate utilization of the land for grazing and haying purposes. For much of the CRP acreage, the type of grass planted will limit the attractiveness of this option for some landowners. For example, lovegrass provides an excellent conservation cover for the land, but is not an easy grass to manage for livestock grazing. Other species of grass more readily lend themselves to establishment of livestock operations; however, a large portion of the CRP acreage in some areas was planted to lovegrass because of easy establishment and low seed cost.

The wide range in projections of acceptance of this option is due to uncertainties regarding the effects of production economics and conservation regulations at the time of contract expiration. Since many of the CRP lands are marginal in terms of production, relatively small changes in policies or commodity prices can have a large impact on conversion decisions.

4. Some farmers may choose to convert a portion of the CRP acreage back into cultivation while leaving some areas or strips in permanent grass. In many cases, grass strips can facilitate implementation of the conservation compliance requirements and lessen the economic impacts of those requirements on the farming operation. Permanent grass windstrips, appropriately spaced, offer an excellent alternative for many farmers and could be encouraged with appropriate USDA policies. In many cases, a field corner or shallow, rocky soil area, may be left in grass while other areas are converted into cropland. It is estimated that 10% to 15% of producers will select this option for a portion of the CRP acreage.

5. Some producers may elect to convert CRP acreage into a permanent wildlife and recreation area once the contract expires. This would involve maintenance of the current cover. Where landowners have taken full advantage of these land uses during the contract period by making plantings of wildlife food plots and in other ways enhancing the wildlife habitats, this option will be more attractive. The landowner will have more flexibility in land management following contract expiration to facilitate development of such an enterprise.

6. An anticipated option, not yet defined though mentioned in the 1990 Farm Bill, is the opportunity for farmers to extend their contract beyond the current 10-year period. This will involve establishment of policies within USDA to provide financial incentives for farmers to extend existing contracts at or above current annual rental payment levels. This would be an attractive option for many, and an estimated 50% to 75% of current contracts would be extended if the option is available and sufficiently attractive. It is projected that contract extension would virtually eliminate selection of the grazing option and greatly reduce conversion back to cropland in the short run.

A variation of this option would be for landowners to extend their contracts at a reduced rate of annual rental payment and be allowed to hay or graze the land. This would be the option of choice for an estimated 10% to 15% of producers and would perpetuate the current grass cover further into the future.

7. Another option which is included in the 1990 Farm Bill and which would be attractive to a limited number of landowners is to grant long-term easements on CRP contract lands. Although this option is not attractive to most because of the length of time that easements dictate landuse restrictions, it will be appropriate for a few. Less than 5% of producers will select such an option.

8. Some landowners either will sell the land to others or convert it to another type of landuse following contract expiration. In some cases where land is adjacent to urban centers, development of residential, commercial, or industrial areas nearby will cause this to be a reasonable alternative. Many such lands will become

idle in the short run. Less than 2% of the current CRP acreage will be subject to this option.

Factors Impacting Option Selection

Once the contract expiration date nears, farmers will consider the many options available to them in determining future use of CRP lands. A number of factors will be involved in that decision making, although economics will be the chief consideration for most. The comparison of income from CRP acreages relative to adjacent non-CRP acreages will be a major factor in determining whether the land is converted back into cropland. If adjacent similar land in row crops is providing a greater income than the CRP annual rental payment, farmers will likely convert the CRP acreage back into cropland. Of course, that decision will be tempered by the same kinds of considerations which caused the farmer to bid the land into the CRP program initially.

The individual size of contiguous land units in the CRP will have an impact on the option selected. If the individual units are relatively small and widely separated, conversion of CRP land into grazing land for livestock production will be more difficult than if individual units are relatively large and in close proximity to one another.

Location of the land in CRP, relative to other lands owned or controlled by a producer on which a livestock operation is being operated, will affect option selection. Producers with nearby livestock enterprises will more likely maintain their CRP grass cover and convert the land to grazing or haying.

The availability of a livestock infrastructure within the county also will determine whether conversion of CRP acreage to grazing and haying land is a viable option. In many areas, such as the High Plains of Texas, very few CRP contract lands currently are fenced and very few livestock are produced in those counties. This situation limits livestock marketing opportunities, increases transportation costs, and otherwise complicates utilization of the lands for livestock production. Production of hay is similarly constrained.

In many areas, farmers who have bid land into the CRP program do not live on the land, but rather in nearby urban areas. Such a living arrangement will tend to favor the conversion of CRP acreages into cropland rather than livestock production since many types of livestock operations require close and frequent personal observation.

The types of land and quality of soils bid into the CRP program will affect the determination of suitability for future cropland use. If the soils are droughty, extremely highly erodible, shallow, or have other major limitations, some type of option involving a permanent grass cover will be more attractive than conversion back into production of row crops, in part due to conservation regulations.

The presence or absence of a commodity base on the CRP acreage also will be a factor in option selection by the farmers. On land that has no commodity base, depending on the specific requirements of USDA commodity programs at the time the contract expires, the landowner may not have the flexibility to produce commodity crops on land becoming available through contract expiration. However, if a farmer bid only a portion of his land into the CRP and it retains a full base allocation, the option of conversion back into row crops will be much more attractive.

Conclusions

Farmers were guaranteed that CRP acreage would be treated the same upon contract expiration as similar adjacent land that was not bid into the CRP. They are depending on that guarantee and on the options that were available to them at the time of contract establishment.

Many options will be available to landowners when their CRP contracts expire unless significant changes occur. The factors that will impact option selection are many. The two principal options at this time will be: (a) to plow the grass out while establishing appropriate conservation practices to allow for row crop production, and (b) to maintain the permanent grass cover and utilize the area for livestock or hay production. Several variations of these options will be available and contract extension could postpone a final decision.

USDA programs will have a major impact on the final decision. If elevated cost-share levels are available to establish fences, water supplies, and other practices necessary to retain the permanent grass cover and convert it into pastures for livestock production, it would be anticipated that a larger percentage of landowners will retain the present grass cover. However, if commodity programs and economic conditions present conditions of economic advantages to row crops, then farmers can be expected to convert the vast majority of the CRP acreage back into row crop production following contract expiration. The opportunity to extend existing contracts will be a popular option.

In many cases, existing annual rental payments will not be adequate to prevent the conversion of the CRP acreage back into row crop production. Further development of the CRP program should include incentives to encourage farmers to retain grass covers on highly erodible land.

Literature Cited

Harris, B. L.; Habiger, J. N.; Carpenter, Z. L. 1989. The conservation title: concerns and recommendations from the Great Plains. Journal of Soil and Water Conservation. 44(5): 371–376.

Nowak, P.; Schnepf, M. 1989. Implementing the conservation provisions in the 1985 Farm Bill: a follow-up survey of county-level U.S. Department of Agriculture agency personnel. Journal of Soil and Water Conservation. 44(5): 535–542.

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The Conservation Reserve Program: Effects on Soil, Water and Environmental Quality

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Abstract.—Annual runoff and deep percolation estimates decreased and evapotranspiration rates increased for most study sites when management was changed from crop to CRP. The CRP is most effective in reducing soil erosion in the Great Plains and the Northwest where erosion rates (6 to 152 tons per acre) under crop management are high. The CRP program is meeting its objectives of reducing soil erosion and sedimentation.

Introduction

The Conservation Reserve Program (CRP), authorized by Title XII of the 1985 Food Security Act, redirected monetary and human resources toward soil conservation and indirectly toward control of agricultural nonpoint source pollution. The resources authorized by Congress for CRP are larger than those authorized for implementation of Section 319 of the 1987 Water Quality Act (Smolen et al. 1988). The Environmental Protection Agency (EPA) and many environmental groups view CRP as a way to retire land that is degrading to water quality and satisfy the nonpoint source pollution requirements of the Water Quality Act (Ribaudo 1989, Smolen et al. 1988).

The CRP is a 10-year cropland retirement program designed to protect the nation's most highly erodible and fragile cropland. The goal of CRP is to shift 40–45 million acres of highly erodible land from crop production to trees, forbs, shrubs, and grasses for at least 10 years. The objectives of CRP are to: (1) reduce water and wind erosion; (2) protect our long-term capability to produce food and fiber; (3) reduce sedimentation; (4) improve water quality; (5) create better habitat for fish and wildlife through improved food and cover; (6) curb production of surplus commodities; and (7) provide needed income support for farmers (FR Vol. 52 (28):4265–4275).

The CRP eligibility criteria are: (1) cropland having an erosion index greater than 8, and a predicted annual erosion rate greater than that recommended by the SCS Field Office Technical Guide; (2) land capability class (LCC) II, III, IV, or V with a universal soil loss equation (USLE) soil loss estimate of three times the Loss Tolerance (T); (3) LCC II, III, IV, or V with USLE soil loss estimates of two times T or greater and with a serious gully erosion problem; or (4) LCC VI, VII, or VIII (Abdalla and McSweeny 1986, Smolen et al. 1988).

The ninth CRP enrollment ending August 4, 1989, brought the total acres enrolled under CRP to 33.9 million with an estimated reduction in soil erosion of 656 million tons per year. The CRP enrollment is concentrated in the northern and central Plains States with the greatest enrollment in Texas and North Dakota. CRP enrollment in Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Oklahoma, and Texas accounts for 72% of CRP acres, and 70% of the estimated erosion reduction (SCS 1990). Ribaudo et al. (1989) reported that per-acre natural resource economic benefits of land enrolled in CRP was lowest in the northern and southern Plains States and highest in the Northeast and Lake States, where the population, thus the demand for resources, is highest.

Abdalla and McSweeny (1986) stated that CRP may prove to be the most important soil conservation program in the history of the United States. Ribaudo et al. (1989) estimated that a fully implemented 45-million-acre CRP will generate about 10 billion dollars in natural resource benefits. The largest share of benefits will come from improved wildlife habitat (40%) and surface water quality improvements (37%), with soil productivity, air quality, and groundwater supply benefits being less

significant. The potential benefits of CRP to natural resources have been reported to be significant (Berthelsen et al. 1989, Ribaudo 1989, Ribaudo et al. 1989). Likewise, the CRP is viewed by environmentalists as a major vehicle in the nation's effort to reduce nonpoint pollution from cropland (Ribaudo 1989, Smolen et al. 1988). The objective of this study is to evaluate the effectiveness of CRP in reducing runoff and erosion, and changes in evapotranspiration and deep percolation (water percolation below the root zone) from highly erodible cropland using estimates provided by the Water Erosion Prediction Project (WEPP) computer model and the Wind Erosion Equation (WEE).

Procedures

Study Sites

The study area was limited to the 17 western states plus Minnesota and Missouri (table 1, fig. 1). Minnesota and Missouri were included because of their similarity with the western landscape, and Arizona, California, Nevada, and Utah were excluded because of their low CRP enrollment and/or similarity with CRP land of adjacent states. The SCS Range Conservationists selected one or two counties that represented the CRP acreage of their state. The district conservationist (DC) for the selected counties chose the study sites and provided the necessary information to parameterize the WEPP model and WEE. Study sites' selection criteria were: (1) representative of large acreage enrolled in CRP; (2) typical dryland cropping systems; (3) typical soils and slopes; (4) typical erosion rates prior to enrollment in CRP; and (5) major land resource regions (SCS 1981). Table 1 provides the location and a brief description of each study site. Study sites were located in the following land resource regions: Northwestern Wheat and Range, Western Range and Irrigated, Northern Great Plains Spring Wheat, Western Great Plains Range and Irrigated, Central Great Plains Winter Wheat and Range, Northern Lake States Forest and Forage, and Central Feed Grains and Livestock (fig. 1). The DC's were sent a questionnaire requesting the necessary information to parameterize the WEPP model and WEE for each study site. Telephone contact with the DC's was made before filling out the questionnaire, after completing the questionnaire, and when the results of the study were reported. This helped clarify the information being requested, the information provided, and confirmed the results.

Table 1.—Location and brief description of study sites by major land resource regions.

State/county	Land resource area	Land capability class[1]	Soil series	Major crop(s)	Crop production
		Northwestern Wheat and Range Region			
Idaho					
Elmore	Snake River Plains	VIe	Lankbush-Jenness loam	Wheat/fallow	15/0 bu/ac
Bonneville	Snake River Plains	IIIe	Ririe silt loam	Wheat/fallow	30/0 bu/ac
Oregon					
Sherman	Columbia Plateau	IIIs	Condon silt loam	Wheat/fallow	28/0 bu/ac
Sherman	Columbia Plateau	IVe	Walla Walla silt loam	Wheat/fallow	30/0 bu/ac
Washington					
Asotin	Palouse and Nez Perce Prairies	IVe	Chard loam	Wheat/fallow	45/0 bu/ac
Grant	Columbia Plateau	VIIe	Zen silt loam	Wheat/fallow	28/0 bu/ac
		Western Range and Irrigated Region			
Colorado					
Moffat	Central Desertic Basins, Mountains and Plateaus	IVe	Berlake-Mayspring sandy loam	Wheat/fallow	19/0 bu/ac
		Northern Great Plains Spring Wheat Region			
Montana					
McCone	Rolling Soft Shale Plain	IVe	Cambert-Dast-Cabba Loam	Wheat/barley/fallow	28/35/0 bu/ac
Teton	Brown Glaciated Plain	IVe	Kremlin-Delpoint clay loam	Barley/w. wheat/ s. wheat/fallow	25/20/20/0 bu/ac
North Dakota					
Kidder	Central Black Glaciated Plains	IIIe	Arvilla sandy loam	Wheat/barley/fallow	20/30/0 bu/ac
		Western Great Plains Range and Irrigated Region			
South Dakota					
Stanley	Northern Rolling Pierre Shale Plains	IVe	Opal clay	Wheat/fallow	25/0 bu/ac
Wyoming					
Laramie	Central High Plains	IIIe	Vetal five sandy loam	Wheat/fallow	20/0 bu/ac

Table 1.—Location and brief description of study sites by major land resource regions.—Continued

State/county	Land resource area	Land capability class[1]	Soil series	Major crop(s)	Crop production
		Central Great Plains Winter Wheat and Range Region			
Kansas					
Logan	Central High Tableland	VIe	Colby silt loam	Wheat/fallow	18/0 bu/ac
Oklahoma					
Harper	Central Rolling Red Plains	IIIe	Woodward loam	Wheat	30 bu/ac
Nebraska					
Gage	Central Loess Plains	IIIe	Crete silty clay loam	Corn/sorghum/fallow wheat/soybean	70/75/0/35/35 bu/ac
New Mexico					
Curry	Southern High Plains	IVc	Olton clay loam	Wheat	15 bu/ac
Texas					
Haskell	Central Rolling Red Plains	VIe	Miles loam fine sand	Cotton	375 lb/ac
		Northern Lake States Forest and Forage Region			
Minnesota					
Becker	Northern Minnesota Gray Drift	IIIe	Formdale clay loam	Wheat/Barley	40/70 bu/ac
		Central Feed Grains and Livestock Region			
Kansas					
Doniphan	Iowa and Missouri Deep Loess Hills	IVe	Monona silt loam	Corn/soybean	100/35 bu/ac
Minnesota					
Cottonwood	Central Iowa and Minnesota Till Prairies	IIIe	Swanlake loam	Corn/soybean	82/29 bu/ac
Missouri					
Clinton	Iowa and Missouri Heavy Till Plain	IIIe	Grundy silt loam	Corn/soybean	90/35 bu/ac
South Dakota					
Day	Rolling Till Prairie	VIe	Buse-Barnes clay loam/loam	S. wheat/flax/ fallow/rye	24/14/0/35 bu/ac

[1] *III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.*
IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.
VI soils have severe limitations that make them generally unsuitable for cultivation.
VII soils have very severe limitations that make them unsuitable for cultivation.
Capability subclasses: e main limitation is risk of erosion; s soil is limited because it is shallow, droughty, or stony; and c climate is the chief limitation, too cold, or too dry.

Methods

The wind erosion equation (WEE) (SCS 1988) was used to estimate wind erosion of the study sites under crop production and under CRP. The WEE was applied as outlined in the Soil Conservation Service Handbook (SCS 1988). The Water Erosion Prediction Project (WEPP) model (Flanagan 1990, Lane and Nearing 1989) was used to estimate precipitation, runoff, deep percolation, evapotranspiration, and water erosion of the study sites under crop production and under CRP. A 10-year continuous simulation was used with 10 years of simulation assuming typical crop production criteria and with the same 10-year simulation assuming CRP criteria. The mean annual water budget and erosion values are calculated as the mean of the 10-year simulations.

The WEPP model predicts soil loss and deposition on a hillslope. It includes a climate component that uses a stochastic generator to provide daily weather information, an infiltration component that is based on the Green-Ampt infiltration equation, a surface runoff component that is based on the kinematic wave equations, a daily water balance component, a plant growth and residue decay component, and a rill-interrill erosion component (Lane and Nearing 1989). Existing gullies and complex landforms were not addressed in the study. Bromegrass is the only perennial grass with parameter values currently developed for use in the WEPP cropland model that fits the CRP perennial grass cover criteria. Thus, bromegrass was used to represent the perennial grass cover for all CRP sites. The model simulates the temporal changes in plant canopy cover, canopy height, and litter cover influencing runoff and erosion processes caused by converting from crop production to perennial grass. The WEPP model was used rather than the USLE because of its continuous simulation and water balance estimating capabilities. The most recent WEPP model Version 90.9 was used (Flanagan 1990). Even though the

Figure 1.—Study site locations indicated by county, state, and major land resource region.

WEPP model is better suited than the USLE for this type of study, it has not been fully validated for cropland and the erosion rates may differ from USLE estimated rates; however, relative comparisons should be valid.

Results and Discussion

The water budget of an area is partitioned into its various components by the interplay of precipitation with the landscape. Landscape characteristics, e.g., vegetation, soils, geology, topography, and human-induced disturbance are the primary factors influencing segments of the water budget and erosion. The climate and landscape of a site must be such that the infiltration capacity is limiting before surface runoff and water erosion will occur. The areas with the greatest potential for surface runoff and water erosion are generally those areas receiving greater than 20 inches of precipitation (Hudson 1971) or areas with rapid snow melt or rain occurring on frozen soils (Papendick et al. 1983, Zuzel et al. 1982). These include the Central Great Plains Winter Wheat and Range, Central Feed Grains and Livestock, Northern Lake States Forest and Forage, and Northwestern Wheat and Range Regions (table 2). The potential for wind erosion is greatest in arid and semiarid regions receiving less than 25 inches of precipitation (Marshall 1973).

The croplands of the Northwestern Wheat and Range, Western Range and Irrigated, Northern Great Plains Spring Wheat, and Western Great Plains Range and Irrigated Regions (table 2) are generally characterized by less than 15 inches of precipitation and less than 1 inch of surface runoff under crop management. Annual runoff estimates decreased on almost all study sites under CRP and were near zero for a number of the sites (table 2; figs. 2, 3, and 4). This is a result of the increased evapotranspiration (ET) and site stability under perennial grass cover, and the elimination of tillage disturbances that reduce soil structure and infiltration capacity. For most arid and semiarid sites, water is the limiting factor for plant growth and almost all the precipitation falling on these sites is utilized equally well by crops or grasses.

The perennial grass cover established under CRP increased annual transpiration rates of all study sites and consequently total ET (table 2). Increased ET for sites

Table 2.—Study site mean annual rainfall, runoff, evapotranspiration, deep percolation, water and wind erosion, and maximum monthly water erosion under crop production and under CRP by major land resource regions.

Study site State/county		Variable mean annual[1] Rainfall (in)	Runoff (in)	Evapo-transpiration (in)	Deep percolation (in)	Water erosion (ton/acre)	Wind erosion (ton/acre)	Maximum monthly water erosion (ton/acre)
				Northwestern Wheat and Range Region				
Idaho								
Elmore	Crop	7.7	*	7.7	0.1	T	6.0	0.1
	CRP	7.7	*	7.9	*	T	T	T
Bonneville	Crop	13.7	0.3	13.2	*	1.7	3.0	4.9
	CRP	13.7	*	13.8	*	T	T	0.2
Oregon								
Sherman	Crop	9.7	0.2	9.5	*	1.8	T	6.0
	CRP	9.7	*	9.7	*	T	T	T
Sherman	Crop	9.7	0.5	9.0	0.1	0.8	8.5	1.3
	CRP	9.7	0.3	9.5	*	0.1	T	0.2
Washington								
Asotin	Crop	14.7	0.6	13.2	0.9	11.6	2.0	39.9
	CRP	14.7	0.3	14.0	0.3	0.2	T	0.5
Grant	Crop	8.4	0.1	8.3	*	0.5	2.0	1.9
	CRP	8.4	*	8.4	*	T	T	T
				Western Range and Irrigated Region				
Colorado								
Moffat	Crop	12.6	0.1	12.3	0.2	0.3	12.5	1.7
	CRP	12.6	*	12.6	*	T	T	T
				Northern Great Plains Spring Wheat Region				
Montana								
McCone	Crop	11.9	0.4	11.1	0.4	1.7	12.5	3.1
	CRP	11.9	0.1	12.0	*	T	T	0.2
Teton	Crop	9.6	0.1	9.2	0.2	0.3	6.0	1.9
	CRP	9.6	*	9.6	*	T	T	T
North Dakota								
Kidder	Crop	14.6	0.4	11.7	2.8	0.6	11.0	1.9
	CRP	14.6	0.4	14.1	0.3	0.2	T	0.4
				Western Great Plains Range and Irrigated Region				
South Dakota								
Stanley	Crop	17.2	5.4	12.0	*	17.5	10.0	23.9
	CRP	17.2	1.8	15.1	*	0.3	T	0.3
Wyoming								
Laramie	Crop	14.5	0.3	13.4	0.8	0.5	7.5	1.5
	CRP	14.5	0.2	14.2	0.1	0.1	T	0.2
				Central Great Plains Winter Wheat and Range Region				
Kansas								
Logan	Crop	17.0	0.6	14.2	2.3	1.8	7.4	2.1
	CRP	17.0	0.4	16.0	0.3	0.8	T	2.8
Oklahoma								
Harper	Crop	22.2	2.1	16.1	4.1	10.2	8.4	8.1
	CRP	22.2	0.7	21.5	*	0.4	T	0.9
Nebraska								
Gage	Crop	28.2	7.4	20.7	*	41.4	T	37.1
	CRP	28.2	1.2	25.7	0.2	1.0	T	1.6
New Mexico								
Curry	Crop	16.7	0.8	12.4	3.5	2.4	4.7	4.3
	CRP	16.7	*	17.3	*	T	T	T
Texas								
Haskell	Crop	28.3	0.3	25.0	3.9	6.4	20.0	9.9
	CRP	28.3	0.4	27.8	*	0.5	T	0.8
				Northern Lake States Forest and Forage Region				
Minnesota								
Becker	Crop	22.1	2.7	18.7	1.2	23.3	T	29.6
	CRP	22.1	0.2	21.8	0.4	0.1	T	0.3
				Central Feed Grains and Livestock Region				
Kansas								
Doniphan	Crop	36.2	5.7	30.0	*	151.5	T	143.1
	CRP	36.2	0.5	32.9	1.6	1.1	T	6.1
Minnesota								
Cottonwood	Crop	23.1	0.5	22.0	0.2	5.9	6.0	6.5
	CRP	23.1	0.1	22.9	*	T	T	0.2
Missouri								
Clinton	Crop	34.4	2.9	31.2	0.4	46.8	T	43.5
	CRP	34.4	0.3	31.1	2.6	0.5	T	2.0
South Dakota								
Day	Crop	18.4	3.8	14.7	*	39.6	7.0	85.3
	CRP	18.4	1.2	17.3	*	0.2	T	0.6

[1] *Unbalanced water budgets are the result of changes in soil water storage.*
* *Less than 0.1 inch.*
T Less than 0.1 ton per acre water erosion or less than 1 ton per acre wind erosion.

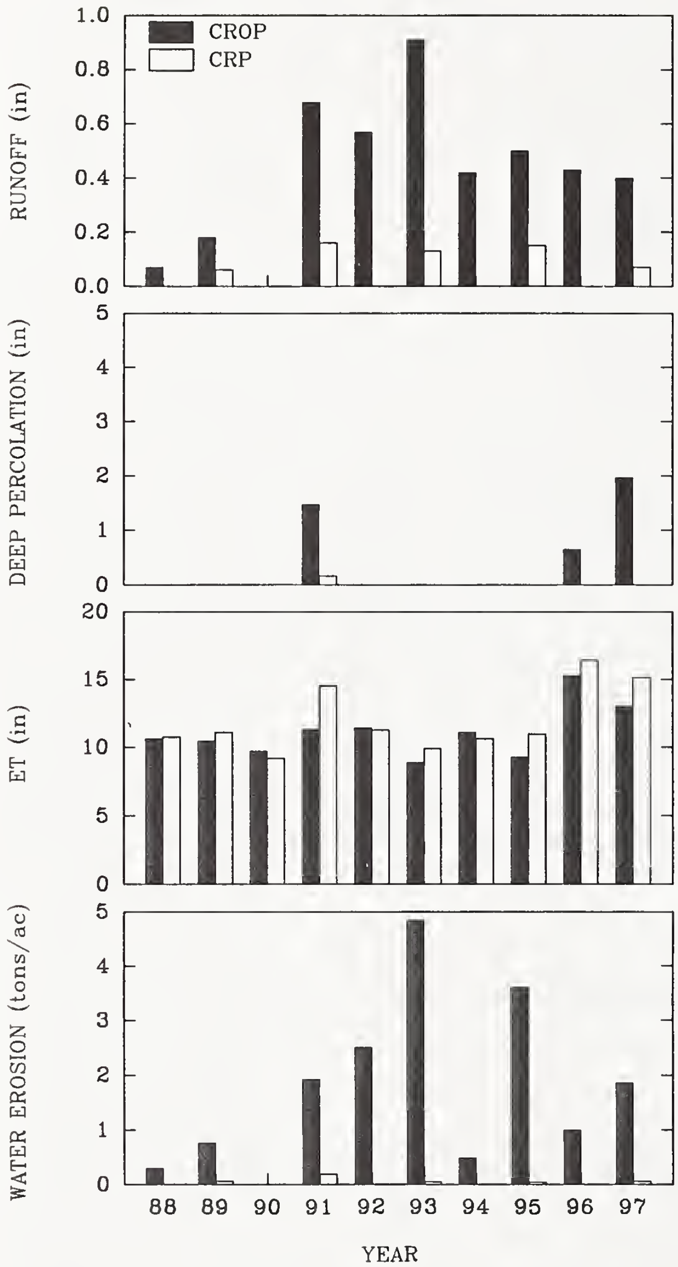

Figure 2.—Total annual components of the water budget and water erosion for the 10-year WEPP simulation, McCone County, Montana, located in the Northern Great Plains Spring Wheat Region.

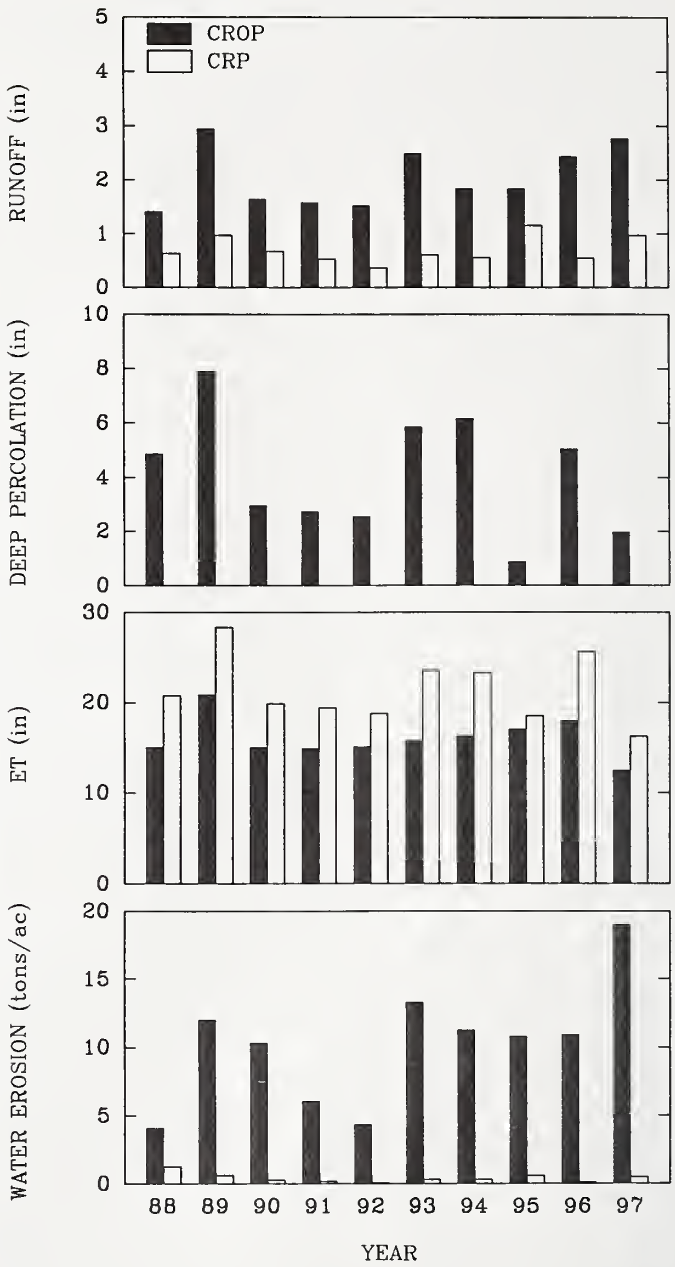

Figure 3.—Total annual components of the water budget and water erosion for the 10-year WEPP simulation, Harper County, Oklahoma, located in the Central Great Plains Winter Wheat and Range Region.

under CRP as compared to crop management is attributed to changes in site characteristics that influence the components of the water budget. These changes include changing the site from an annual crop or crop/fallow rotation systems, which transpires only during a portion of the growing season or conserves soil water on fallow years, to a perennial grass cover with increased transpiring surface (leaf area) that transpires throughout the growing season every year. The greatest ET increases from crop management to CRP management were in the Central Great Plains Winter Wheat and Range (fig. 3), Northern Lake States Forest and Forage, and eastern portion of the Western Great Plains Range and Irrigation Regions. Although ET was estimated to increase under CRP in the Northwest Wheat and Range, Western Range and Irrigated, and Northern Great Plains Spring Wheat (fig. 2) Regions, increases were estimated to be small.

Water percolating below the root zone decreased for all study sites under CRP except Doniphan County, Kansas (fig. 4) and Clinton County, Missouri in the

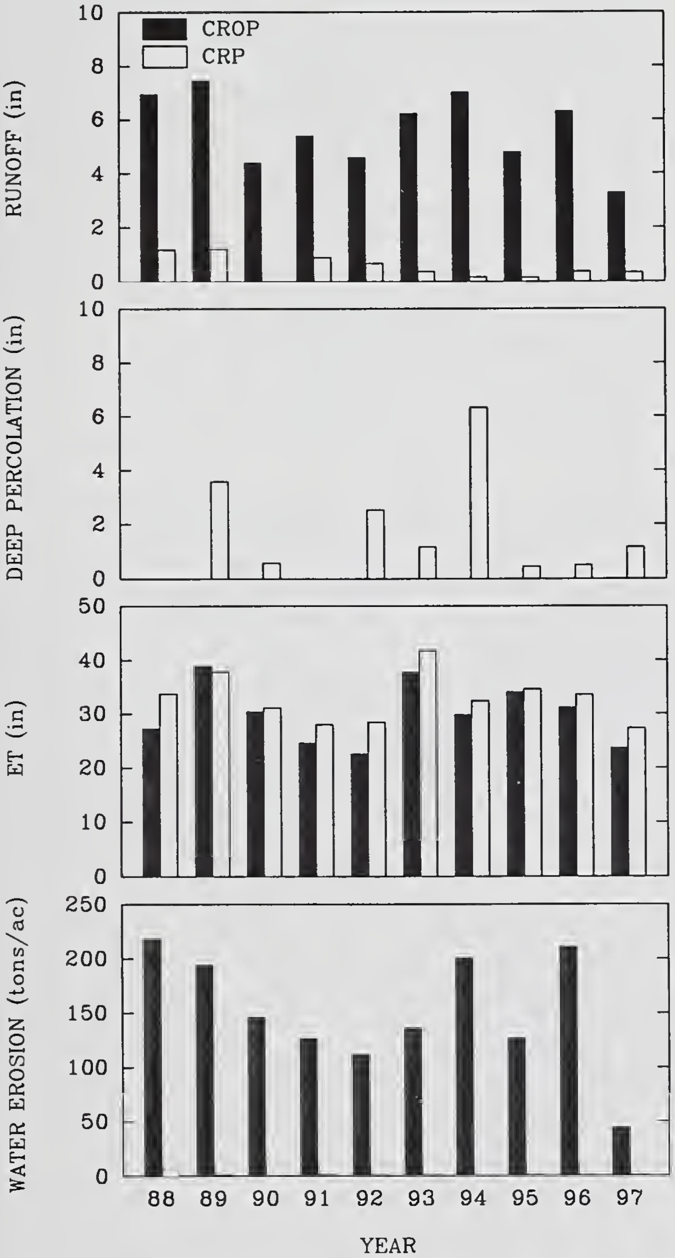

Figure 4.—Total annual components of the water budget and water erosion for the 10-year WEPP simulation, Doniphan County, Kansas, located in the Central Feed Grains and Livestock Region.

Central Feed Grains and Livestock Region (table 2). The increase in deep percolation at these sites under CRP is attributed to the high annual precipitation (>30 inches) and increased soil infiltration capacity. The decreases in estimated deep percolation at the other study sites are generally attributed to increased transpiration under CRP. The greatest reduction in deep percolation estimates from crop management to CRP management occurred in the Central Great Plains Winter Wheat and Range, Northern Great Plains Spring Wheat Regions, and Asotin County, Washington, Northwestern Wheat and Range Regions which generally receive between 15 and 30 inches of precipitation annually (table 2). Very little deep percolation was estimated for study sites receiving less than 15 inches of precipitation regardless of the management.

Mean annual water and wind erosion estimates decreased for all sites after they were placed under the CRP (table 2). Perennial grass cover under the CRP provides canopy and litter cover, and below-ground root biomass that protects the soil throughout the year from the erosive forces of rain, runoff, and wind. The model predicted that several years of perennial grass cover are needed for complete site stabilization. Under pre-CRP crop management the sites are frequently disturbed by the various cropping practices. Tillage timing, type, depth, and frequency influence the amount of surface soil residue and soil hydrologic properties. Each tillage operation mixes some crop residue into the soil, thus reducing surface residue. The kind of crop also influences the amount of canopy and residue cover of a site. Soybeans, for example, leave little residue after harvest, while corn provides a large amount of residue when harvested for grain. These crop management and tillage practices, climate, and the natural erosiveness of the landscape determine the vulnerability of each site to erosion.

The largest water erosion under crop management occurred in Doniphan County, Kansas (152 tons/acre) in the Central Feed Grains and Livestock Region (table 2, fig. 5). Sites in the Central Great Plains Winter Wheat and Range, Northern Lake states Forest and Forage, Western Great Plains Range and Irrigated, and Northwestern Wheat and Range Regions also had high annual water erosion rates (6 to 50 tons per acre). These sites are characterized by a climate and landscape that is susceptible to water erosion under pre-CRP crop management practices. Estimated maximum monthly erosion rates were high for the 10-year simulation for Doniphan County, Kansas (143 tons per acre), Clinton County, Missouri (44 tons per acre), Gage County, Nebraska (37 tons per acre) Day and Stanley Counties, South Dakota (85 and 24 tons per acre), respectively, and Asotin County, Washington (40 tons per acre) (table 2). These maximum erosion rates demonstrate the susceptibility of a given site to periods of extreme soil erosion, especially during the highly vulnerable periods of little or no plant canopy or residue cover. At these sites, CRP management had the greatest reduction in maximum monthly and mean annual water erosion. The largest decrease in soil erosion was estimated for the Doniphan County, Kansas site, where a mean annual erosion of 152 tons per acre under crop management was reduced to 1 ton per acre under CRP management (fig. 4). The water erosion rates of all sites under CRP were estimated to be less than 1 ton per acre per year with most erosion rates for land under CRP estimated to be less than 0.5 tons per acre per year (figs. 2 and 3). In the more humid regions, WEPP predicted that the majority of the annual water erosion results from a few large storms (fig. 4). This has been observed by field research (Blackburn et al. 1986). In the more arid regions, water erosion is also

Figure 5.—Mean annual water and wind erosion (tons per acre) of the study sites under crop management (solid bars) and CRP (open bars).

episodic, the result of a few large storms that are much less frequent than for humid areas (fig. 2).

Mean annual wind erosion for the study sites was greatest (6 to 20 tons per acre) in the Central Great Plains Winter Wheat and Range, Western Range and Irrigated, Northern Great Plains Spring Wheat, Western Great Plains Range and Irrigated, Northwestern Wheat and Range, and parts of the Central Feed Grains and Livestock Regions (table 2, fig. 5). WEE estimates indicate that CRP was most effective in reducing wind erosion in these same regions. Annual wind erosion under CRP was estimated to be 1 ton per acre or less.

Summary and Conclusions

Landscape characteristics, especially human-induced disturbances are the primary factors influencing segments of the water budget and erosion. The areas with the largest potential for surface runoff and water erosion are generally those areas where annual precipitation is greater than 20 inches. However, potentially high wind erosion areas are located in regions receiving less than 25 inches of precipitation.

The largest annual water erosion rate from areas managed for crop production occurred in the Great Plains

and the Northwest. Likewise, the largest reduction in annual water erosion resulted from shifting from crop to CRP management on these same highly erodible sites. Mean annual water erosion rates of all sites managed under CRP were estimated to be less than 1 ton per acre. Although water erosion rates for some of the more arid sites under crop management were small and reduction in erosion rates under CRP was small, many of these sites are characterized by shallow soils and the site productivity is vulnerable to small erosion rates.

Annual wind erosion estimated by WEE was greatest in the Great Plains on sites receiving less that 25 inches of precipitation and in the Northwest. The WEE estimated annual wind erosion rates for all sites under CRP to be less than 1 ton per acre, with the largest reduction occurring on sites with the highest pre-CRP erosion rates.

Annual runoff estimates decreased for most study sites under CRP and was estimated to be near zero for a number of the sites under CRP. The perennial grass cover established under CRP increased the annual transpiration rate of all study sites and consequently the total ET. Water percolating below the root zone was estimated to decrease under CRP for all study sites except the higher precipitation (>30 inches) areas represented by Doniphan County, Kansas, and Clinton County, Missouri, where the increase in deep percolation under CRP was attributed to the high annual precipitation and increased soil infiltration capacity under the CRP perennial grass cover.

Of the original CRP objectives, this study only directly addressed the objective to reduce water and wind erosion. However, indirectly the study addresses the objectives to protect our long-term capability to produce food and fiber and to reduce sedimentation and improve water quality. This study shows that the CRP is meeting the objective to reduce water and wind erosion. The estimated annual water and wind erosion of all sites studied was reduced under the CRP program to 1 ton per acre or less. The reduction in annual erosion rates for the study sites was estimated to be as much as 152 tons per acre. This study indicates that land under the CRP will be more effective in routing precipitation onsite through increased infiltration and ET rates. Because of the substantial reduction in the amount and magnitude of surface runoff, subsurface flow and susceptibility to erosion, water quality should be significantly improved.

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Literature Cited

Abdalla, C. W.; McSweeny, W. T. 1986. Soil erosion: addressing the problem. Farm Economics, Pennsylvania State University, Cooperative Extension Service. 4 p.

Berthelsen, P. S.; Smith, L. M.; Coffman, C. L. 1989. CRP land and game bird production in the Texas High Plains. Journal of Soil and Water Conservation. 44: 504–507.

Blackburn, W. H., Wood, J. C.; DeHaven, M. G. 1986. Stormflow and sediment losses from site-prepared forestland in east Texas. Water Resources Research. 22: 776–784.

Flanagan, D. C. 1990. Water erosion prediction project: hillslope profile model documentation corrections and additions. Rep. No. 4. West Lafayette, IN: U.S. Department of Agriculture, Agricultural Research Service, National Soil Erosion Research Laboratory.

Hudson, N. 1971. Soil conservation. Ithaca, NY: Cornell University Press.

Lane, L. J.; Nearing, M. A. 1989. USDA Water erosion prediction project: hillslope profile version. Rep. No. 2. West Lafayette, IN: U.S. Department of Agriculture, Agricultural Research Service, National Soil Erosion Research Laboratory.

Marshall, J. K. 1973. The environmental, economic, and social significance of drought. Lovett, J. V., ed. Angus and Robertson Publishers.

Papendick, R. I.; McCool, D. K.; Krauss, H. A. 1983. Soil conservation: Pacific Northwest. In: Dryland agriculture. Agronomy Mono. No. 23. Madison, WI: American Society of Agronomy-Crop Science Society of America, Soil Science Society of America.

Ribaudo, M. O. 1989. Targeting the Conservation Reserve Program to maximize water quality benefits. Land Economics. 65: 320–332.

Ribaudo, M. O.; Piper, S.; Schaible, G. D.; Langner, L. L; Colacicco, D. 1989. CRP, What economic benefits? Journal of Soil and Water Conservation. 44: 421–424.

Smolen, M. D.; Adler, K. J.; Lanier, A. L.; Hoag, D. L.; Miller, D. W. 1988. Interfacing nonpoint source programs with the Conservation Reserve: guidance for water quality managers. EPA Rep. No. 506/2–88/001. Reproduced by USDC National Technical Information Service, Springfield, VA. 22161 as PB89–134126.

Soil Conservation Service. 1981. Land resource regions and major land resource areas of the United States. Agric. Handb. 296. Washington, DC: U.S. Department of Agriculture, Soil Conservation Service.

Soil Conservation Service. 1988. Erosion handbook, wind and water. Washington, DC: U.S. Department of Agriculture, Soil Conservation Service.

Soil Conservation Service. 1990. Conservation Reserve Program (CRP). Nat. Bull. No. 300–0-8. Washington, DC: U.S. Department of Agriculture, Soil Conservation Service.

Zuzel, J. F.; Allmaras, R. R.; Greenwalt, R. 1982. Runoff and soil erosion on frozen soils in Northeastern Oregon. Journal of Soil and Water Conservation. 37: 352–354.

Conservation Reserve Program Effects on Wildlife and Recreation

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Abstract.—Wildlife and wildlife-associated recreation can be improved immensely from the establishment of grassland habitat by the Conservation Reserve Program (CRP). The amount, distribution, and type of cover established by CRP will greatly affect the effect on wildlife and recreation. Haying and grazing management of CRP will also be a major factor.

Introduction

Increased soil erosion, deteriorating water quality, precipitous declines in wildlife populations, and loss of recreational opportunity all too often have been associated with changing agricultural land use practices of the past 50 years (Jahn and Schenck 1990, Langner 1989). For example, ring-necked pheasants, cottontail rabbits, and bobwhite quail—species that once benefited from early mosaic cropland patterns—have declined by more than 50% in the Midwest because of the loss of grassland habitat (Brady and Warner 1985). Shrinking grassland nesting habitat also has led to record low waterfowl populations and near extirpation of many other key wildlife species in some regions (Graber and Graber 1983, USF&WS 1986).

Faced with these sort of challenges, fish and wildlife conservationists look to the CRP with a great deal of hope and promise, with good reason. Establishment of long-term, protective vegetative cover on 40–45 million acres of highly erodible croplands offers new opportunity for reversing resource loss and degradation. A resurgence of wildlife populations on CRP lands also translates into immense opportunities for wildlife-associated recreation.

Wildlife and Recreation Value

Experience with Soil Bank

Some past federal cropland retirement programs, particularly the 1956 Soil Bank program, have benefited wildlife dramatically. At its peak in 1960, more than 28 million acres of undisturbed grassland or woody cover were established in that program (Berner 1988).

In general, pheasant population increases typified wildlife responses to the Soil Bank. South Dakota's pheasant population in the mid-1950's, for example, ranged from 4 to 6 million birds, prehunting season. With 1.8 million acres of vegetative cover in the Soil Bank, pheasant numbers increased to 8 to 11 million birds (Dahlgren 1967). In Michigan, pheasant production was 2 to 3 times higher on farms enrolled in the Soil Bank than on farms not in the program (Fouch 1963). Overall in the Midwest, attractive habitat provided through the Soil Bank program supported pheasant populations that were up to 100% higher than those without the disturbed vegetation (Berner 1988, Schrader 1960).

The Soil Bank also proved to be a boon to sportsmen and rural economies. Erickson and Wiebe (1973) found that numbers of nonresident pheasant hunters were directly correlated to abundance of South Dakota's pheasants. Higher pheasant numbers in the late 1950's and early 1960's because of improved habitat provided by Soil Bank were responsible for a 250% (50,000) increase in nonresident numbers. Conservatively, these additional hunters contributed over $10 million each year to South Dakota's economy (Berner 1988). Increased revenues from sportsmen totaled more than 55% of the amount spent annually on Soil Bank in South Dakota by the federal government (USDA 1970).

CRP and Wildlife

With nearly 34 million acres of highly erodible lands enrolled, CRP promises to have a wildlife and

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recreational value far surpassing the heyday of Soil Bank. Nevertheless, several factors will influence the extent of CRP's effect on wildlife populations. A primary factor is the type of vegetation established. Native grasses and legumes are highly desirable. Acreage being established in trees also provides valuable cover for many species and can enhance wildlife diversity. The quality of the cover established, in terms of height and density, also is important. Other key factors are the geographic distribution of CRP nationwide and the juxtaposition of CRP lands with other land use types, particularly its proximity to cropland used by wildlife for food. Finally, management of CRP vegetation, particularly haying, grazing, and mowing, both during and after the 10-year contract period, will affect its wildlife potential.

CRP distribution.—Nearly half (49%) of the CRP is in the Midwest, with the other half being divided between the South (26%) and the West (24%). Five Great Plains states (Texas, North Dakota, Kansas, Montana, and South Dakota) have 43% of all CRP. Similarly, five southern state (Georgia, Mississippi, Alabama, South Carolina, and Arkansas) have 76% of the CRP planted to trees.

CRP cover types.—Nationwide grass or herbaceous vegetation accounts for 88% of all CRP cover types. Wildlife plantings, which generally are also herbaceous cover, represent another 6%. Native grasses, valuable to many upland gamebirds, are most prevalent in the Midwest and the dominant cover type in only one state, Kansas (figs. 1 and 2). Trees, predominantly pine, are found on nearly 2.2 million acres (6%) of all CRP. Tree plantings can provide good upland habitat during early phases of establishment.

Some of the most valuable CRP cover practices for wildlife have not been well represented. Restored wetlands, floodplains, and filter strip areas account for less than 2% (572,436 acres) of CRP. CRP established in windbreaks and shelterbelts adds up to an embarrassing 6,833 acres (0.02%), while food plots total 14,953 (0.04%).

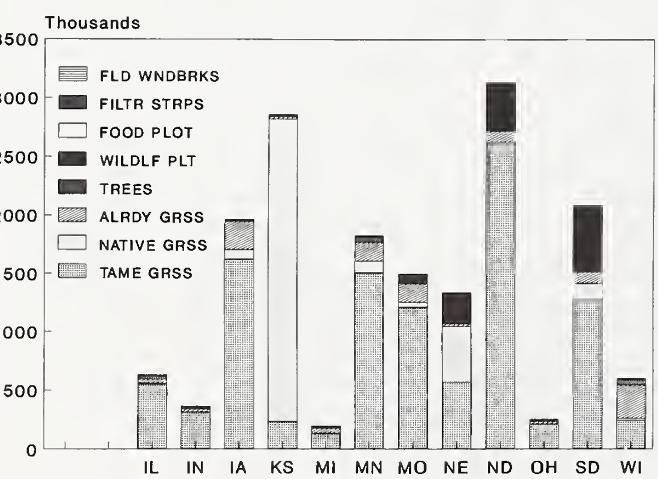

Figure 1.—Cover type acreages established on Conservation Reserve lands in the Midwest (Signups 1-9) (Source: Brady, S. J., Soil Conservation Service, Rocky Mountain Forest and Range Experiment Station, Ft. Collins, CO).

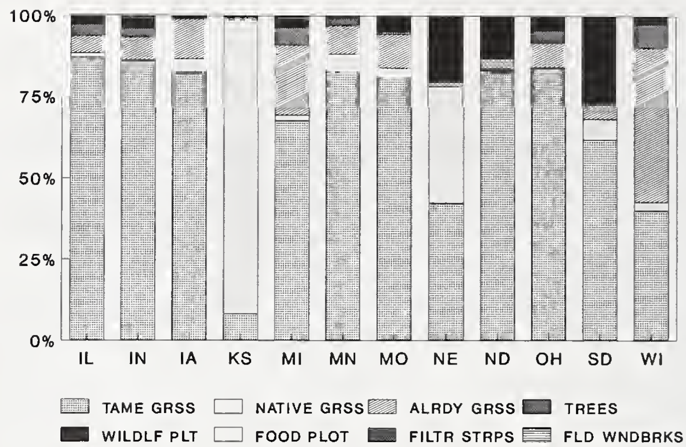

Figure 2.—Percentage of cover types by acreage established on Conservation Reserve lands in the Midwest (Signups 1-9). (Source: Brady, S. J., Soil Conservation Service, Rocky Mountain Forest and Range Experiment Station, Ft. Collins, CO).

Wildlife monitoring results.—A nationwide cooperative monitoring study is currently underway by the U.S. Fish and Wildlife Service to evaluate the effects of CRP cover practices on wildlife habitat. Key habitat variables, such as height of vegetation, are being measured in four study regions (Midwest, Southeast, Southern Great Plains, and Northern Great Plains). Habitat quality for four wildlife indicator species—ring-necked pheasants, bobwhite quail, western/eastern meadowlarks, and cottontail rabbits—is in turn estimated from habitat data (Hays et al. 1989).

Initial study results show that CRP already provides good nesting habitat for pheasants (65% of optimum). Fair (15–25% of optimum) habitat conditions exist for meadowlarks in the Midwest study region, with further improvement likely as CRP stands mature. Virtually no improvement could be detected in cottontail habitat because of lack of woody shrub plantings in CRP. Refinement of the cottontail habitat model, however, will probably result in higher estimates once availability of woody cover adjacent to CRP is properly considered. In general, an increase of woody shrubs, forbs, and food plots is believed to be necessary to maximize upland wildlife benefits on most CRP lands (Hays et al. 1989). Acreages of prime nesting habitat adjusted for differences in habitat quality is illustrated in figure 3.

Localized studies have also documented the value of CRP to wildlife. In the Texas panhandle, Berthelsen et al. (1989) estimated pheasant production on the 116,188 acres enrolled in CRP to be 174,204 chicks per year (1.5 chicks per acre), with an estimated recruitment of 0.37 male pheasants per acre to the fall population. This compares to an estimated pheasant production rate of 76,425 chicks on 142,862 acres (0.53 chicks per acre) and fall recruitment of 0.13 males per acre prior to CRP (Taylor 1980). This potential of tripling pheasant production is not atypical for prime nesting habitat throughout the Midwest (R. Hays, personal communication, 1990). For

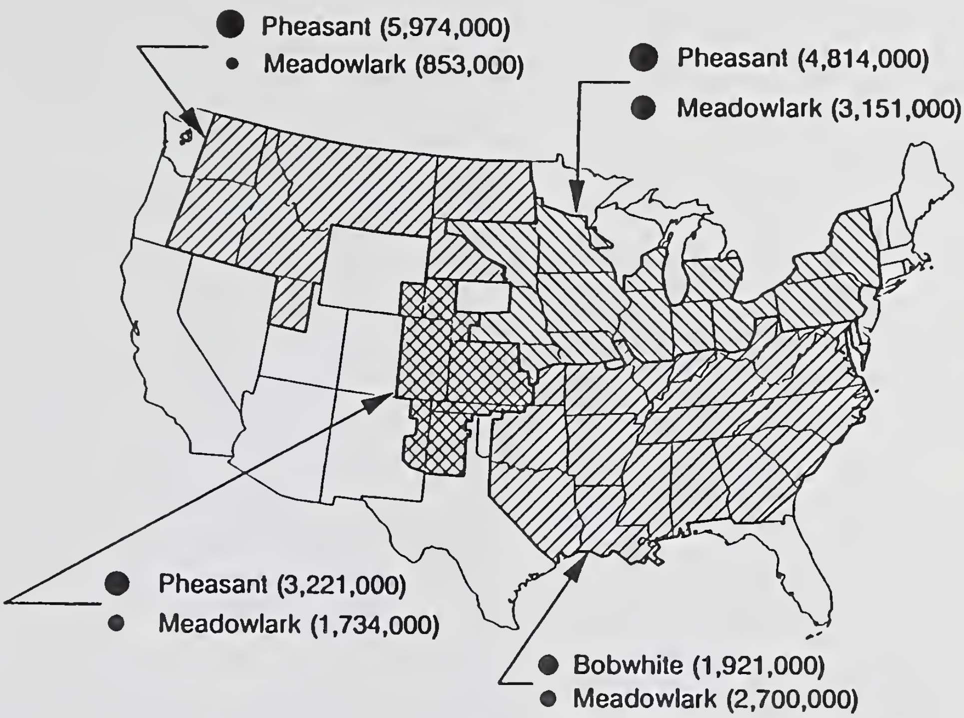

Figure 3.—Equivalent acres of prime nesting habitat for pheasant, meadowlark and bobwhite quail added by the Conservation Reserve Program (Source: Hays, R. L., U.S. Fish and Wildlife Service, National Ecology Center, Fort Collins, CO).

example, the addition of 16,290 acres of CRP in Jefferson County, Wisconsin, also resulted in a three-fold increase in pheasant density from 3.1 hens per square mile in 1988 to 9.9 hens per square mile in 1990. Even more dramatic gains occurred in adjacent Dane County, with 42,781 CRP acres where populations increased about ten-fold when the area was closed to hunting and additional wild-strain birds were released (Rusch 1990).

Similarly, CRP is expected to increase brood rearing and winter roosting habitat for bobwhite quail in northern Missouri (Burger et al. 1990) and to have a positive effect on quail habitat and populations in the Virginia Piedmont (Stauffer 1990). Kantrud (personal communication, 1990) and Berthelsen et al. (1989) have found higher nesting success of dabbling ducks on CRP in North Dakota and Texas, respectively. Densities of non-game birds are also higher on CRP than in most other grassland habitats (R. Hays, personal communication, 1990).

CRP and Recreation

Previous studies have shown that habitat availability and game abundance can affect the decisions of sportsmen of whether or not to hunt, particularly in the case of small or upland game (Walsh et al. 1987). Increases in available habitat and small game populations from CRP acreage are expected to provide added recreational opportunity for both new and existing hunters.

Nationwide, 10.8 million sportsmen spent more than $1.8 billion and 132 million days afield in 1985 small game hunting (USF&WS 1988). Pheasant and quail hunting attracted 34% and 30%, respectively, of the hunters and accounted for 23% and 22%, respectively, of the days afield. Eighty-two percent of all small game hunters hunted on private lands. Private lands also accounted for 75% of all days spent hunting for small game.

Langner (1989) estimated the total net present value of the additional recreational days made available from CRP to be $3.8 billion over a a 14-year period. This figure was based on an average daily value for small game hunting of $36.50 and a 4% discount rate. The greatest regional values were estimated for the Lake States ($1.4 billion) and Corn Belt ($820 million). Comparatively little value was attributed to the Northern and Southern Great Plains ($95 and $77 million, respectively), where CRP enrollment is the highest. The high percentage of grassland and relatively good quality habitat that existed prior to CRP was hypothesized to be the reason for this difference.

In addition to benefiting national, state, and local economies, landowners themselves stand to benefit financially from the recreational value associated with CRP through fee-hunting and access leasing enterprises. Nationwide, an estimated 58,000 sportsmen spent $14.8 million leasing land for small game hunting in 1985 (USF&WS 1988). The amount received by landowners leasing CRP to hunters varies greatly, depending on

differing geographic, cultural, land-use, and clientele situations and on the type of extra service provided. The average fee for quail hunting in 11 southern states, for example, was $1.39 per acre (Busch 1987). On commercial shooting preserves in Missouri, minimal payment for a 1-day gamebird hunt averaged $50.76 (Schenck et al. 1987).

In some regions, new local marketing networks are developing, such as "Pheasants Galore" in Iowa, that link farmers with small game hunters. "Pheasants Galore" provides landowners with as much as $250 per hunter when overnight bed and breakfast services are included in the hunting package. In Kansas, a new program established by the Department of Wildlife and Parks will allow CRP participants and other landowners to bid their land into a public access program for recreational hunting. Payment rates for individual parcels likely will be determined on the basis of its habitat quality and recreational potential, therefore providing an incentive for landowners to improve wildlife conditions on their property. However, this particular proposal has met with difficult opposition from the Kansas Farm Bureau and Livestock Association, and has had its funding severely reduced. As proven in this case, fee-hunting and access leasing are not attractive or even acceptable to all landowners in all regions.

State Initiatives

Several state fish and wildlife agencies have responded positively to the new opportunities for enhancing wildlife habitat and recreational opportunities through the CRP. Many have even made significant investments to help further the program's success. For example, Missouri has provided more than $1 million in supplemental cost-share monies for landowners who agree to establish native grasses and other plantings beneficial to wildlife on CRP lands. Colorado and several other states have followed suit by matching federal cost-shares or providing materials and technical assistance to landowners. South Dakota, eyeing a potential $80 million boost to its state's economy from recreational hunting, has infested in a "Pheasants for Everyone" campaign that includes not only additional cost-share payments, but also access payments for public hunting and up-front, lump-sum rental payments for new CRP participants. Minnesota has even developed its own state-level CRP counterpart, the "Reinvest in Minnesota" or RIM program, to specifically enhance wildlife habitat.

Effect of Haying and Grazing

Given the magnitude of federal and state investments and CRP's unique opportunity for benefiting wildlife and associated recreation, many conservationists are extremely cautious about supporting any haying or grazing on CRP lands for fear that potential negative impacts will compromise hard earned conservation gains and investments. Some of those fears may be well founded based on figures from the 1989 RCA Appraisal (USDA 1989), which reveals that 61% of all nonfederal rangeland (totaling about 405 million acres) is in poor or only fair condition, and that about 70 million acres of private rangeland and another 11 million acres of pastureland is eroding at damaging rates in excess of soil loss tolerance or "T" levels.

Historical overgrazing has also been implicated as the major cause of some species declines and aquatic/riparian habitat degradation. Examples of such grassland dependent species include greater prairie chicken, sharp-tailed grouse, Montezuma quail, and masked bobwhite quail—all endemic gamebirds with marked reduction in original distribution and abundance (Kirsch et al. 1978). Loss of fish habitat and production is also well documented in some cases (Platts 1978).

Although there is considerable evidence that annual overgrazing or haying on upland and riparian habitats is detrimental to most wildlife, there is also general recognition that controlled, periodic treatments to revitalize cover on designated areas by fire, grazing, or mowing may be desirable for the long-term maintenance of wildlife habitat in its best ecological condition. Aldo Leopold (1933) recognized this fact early on when he stated his central theme of game management: "Wildlife can be restored by the *creative* use of the same tools which have heretofore destroyed it—axe, plow, cow, fire and gun." The challenge, therefore, is not to bemoan the problems associated with overgrazing wildlife habitat, but to initiate dialogue for designing strategies, policies, safeguards, and incentives for using grazing as a creative tool for enhancing CRP lands after their 10-year contracts expire.

Haying/Grazing Management

The key to sustaining wildlife habitat on grazed and ungrazed grasslands alike is to maintain sufficient vegetative cover height, density, and diversity (Brown, 1978, Kirsch et al. 1978). Upland gamebirds, waterfowl, and other ground-nesting wildlife rely on residual vegetation from the previous growing season for thermal winter cover and protective spring nesting sites. Several studies have documented the extent to which grazing impacts residual cover and, thereby, affects wildlife production (Brown 1978, Kirsch et al. 1978). Although varying geographic and climatic conditions across the country make generalities difficult, one representative study in Iowa indicated that on grasslands left undisturbed for a period of 5 years, wildlife production was about three times that of annually grazed areas (Krapu et al. 1970). Nesting success on areas left ungrazed for only 1 year was nearly doubled.

Carefully managed, periodic disturbances of some grassland habitat through controlled burning, grazing, or mowing can have a pronounced *positive* effect on vegetative vigor and productivity. Such periodic disturbance on 3- to 5-year intervals has been shown to enhance wildlife production in North Dakota and some other prairie areas by more than 100% (Kirsch 1974, Kirsch et al. 1978). Periodic treatments should be prescribed

burning, short-term grazing, or mowing, and be spaced as many years apart as possible while still maintaining near maximum amount of residual cover. Disturbances should be accomplished in as short of time as possible and scheduled in the disturbance year so as to minimize disruptive effects on nesting wildlife—generally after mid-July.

During drought periods of below average summer precipitation (and, therefore, reduced grass-forb production), grassland wildlife become increasingly dependent upon residual grass cover of previous years. Even conservative utilization of forage in the neighborhood of 20–40% could be highly detrimental to grassland birds or other wildlife by removing vegetative cover required for next year's nesting effort (Brown 1978). Unless some areas are left undisturbed in approved grazing systems, reduced wildlife production is likely to result. Thus, a well considered grazing management plan could perpetuate and even increase populations of grassland wildlife by the interspersion of suitable and sizeable areas of ungrazed climax grassland within grazing units managed in successional stages by periodic disturbances.

CRP Emergency Haying

Release of CRP lands for emergency forage production during the droughts of 1988 and 1989 demonstrates the potential impact of improper haying and grazing management on wildlife.

On June 16, 1988, CRP lands in 13 states were released for emergency hay mowing. By September 30, when emergency haying was ended, CRP lands in 2,209 counties in 43 states had been approved for haying. In a meager attempt to protect wildlife and the establishment of newly seeded cover, haying was restricted to CRP fields planted in 1986 or 1987 and at least 10% of CRP was required to be left uncut. On June 2 of the following year, the Secretary of Agriculture again announced that CRP lands would be available for emergency haying and grazing. However, this time at least 25% of CRP was to be left undisturbed for wildlife.

County field reports estimate that 30–50% of CRP lands in the Midwest may have been cut for haying in 1988. The greatest reported percentage (45%) for an entire state was Wisconsin. Nationwide, 7.7% of all CRP acreage under the 1986 and 1987 contracts was hayed. No reports are yet available on the extent of 1989 haying/grazing activities.

The greatest impact of emergency haying/grazing occurred where release dates overlapped with prime wildlife nesting periods (fig. 4). The magnitude of impact is best demonstrated by earlier studies of haying effects on wildlife mortality. Hartman and Scheffer (1971) reported that an average of 35% of incubating hen pheasants were killed by mowing during peak nesting periods of Pennsylvania. Warner and Etter (1989) also documented that the timing of mowing in Illinois has a direct effect on survival of pheasants and their long-term populations.

Vulnerability of wildlife to mowing is possibly even higher for CRP lands because of their relative attractiveness as nesting cover prior to mowing. In such circumstance, CRP can become an "ecological trap" for pheasants and other birds (Hays and Farmer 1990). Conceivably, counties with relatively high CRP enrollment and high haying (emergency or otherwise) could show actual declines in pheasant populations (A. Berner, personal communication, 1989).

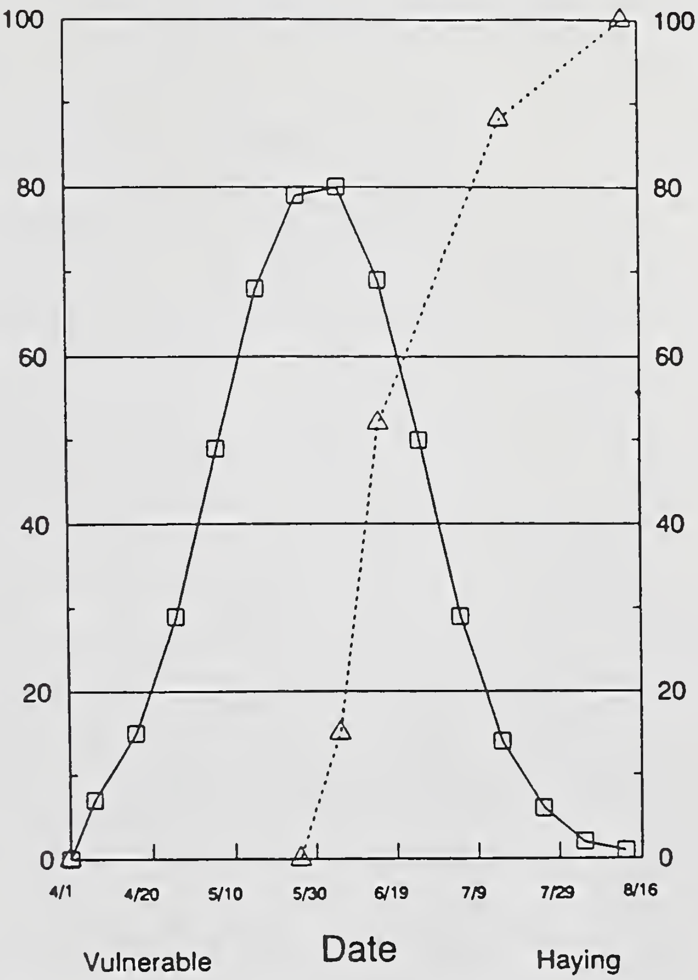

Figure 4.—Overlap of release dates for emergency haying of Conservation Reserve lands with peak wildlife nesting periods. (Source: Hays and Farmer, 1990).

Summary

Overall, landowners, wildlife, and recreationists stand to gain much from the CRP by maintaining enrolled acreages in productive and vigorous vegetative cover. Moreover, the tremendous taxpayer investment in CRP—perhaps amounting to more than $20 billion—suggests its conservation and recreation value should persist beyond the initial 10-year contracts. The fate of CRP vegetative cover many believe lies in finding sustainable alternative uses to row crop production. The challenge, therefore, is to achieve the proper balance of

policy, incentives, and stewardship responsibility to guarantee that the CRP becomes a lasting conservation legacy.

Literature Cited

Berner, A. H. 1988. Federal pheasants—impact of federal programs on pheasant habitat, 1934–1985. In: Hallett, D. L.; Edwards, W. R.; Burger, G. V., eds. Pheasants: symptoms of wildlife problems on agricultural lands. Proceedings of the 49th Midwest fish and wildlife conference: 49–93.

Berthelsen, P. S.; Smith, L. M.; Coffman, C. L. 1989. CRP land and game bird production in the Texas High Plains. Journal of Soil and Water Conservation. 44: 504–507.

Brady, S. J.; Warner, R. E. 1985. The relationship between farmland wildlife, land-use, and erosion and sediment control goals in Illinois. St. Louis: 50th annual meeting of the Soil Conservation Society of America. 12 p.

Brown, D. E. 1978. Grazing grassland cover and gamebirds. Transactions of the North American Wildlife and Natural Resources Conference. 43: 476–485.

Burger, L. W., Jr.; Kurzejeski, E. W.; Dailey, T. V.; Ryan, M. R. 1990. Structural characteristics of vegetation in CRP fields in northern Missouri and their suitability as bobwhite habitat. Transactions of the North American Wildlife and Natural Resources Conference. 55: 74–83.

Busch, F. A. 1987. Lease hunting in the southern United States. South Carolina: Clemson University. M.S. thesis.

Dahlgren, R. 1967. The pheasant decline. South Dakota Department of Game, Fish and Parks. 44 p.

Erickson, R. E.; Wiebe, J. E. 1973. Pheasants, economics and land retirement programs in South Dakota. Wildlife Society Bulletin. 1: 22–27.

Fouch, W. R. 1963. Evaluation of the effect of conservation reserve of the Soil Bank on wildlife. Michigan Job Completion Report, Research Project Segment W-40-R-16-7. 9 p.

Graber, J.; Graber, R. 1983. Declining grassland birds. Illinois Natural History Survey Report 227: 1–2.

Hartman, F. E.; Scheffer, D. E. 1971. Population dynamics and hunter harvest of ring-necked pheasant populations in Pennsylvania's primary range. Transactions of the Northeastern Section of the Wildlife Society. 28: 179–205.

Hays, R. L.; Farmer, A. H. 1990. Effect of the CRP on wildlife habitat: emergency haying in the Midwest and pine plantings in the Southeast. Transactions of the North American Wildlife and Natural Resources Conference. 54: 30–35.

Hays, R. L.; Webb, R. P.; Farmer, A. H. 1989. Effects of the Conservation Reserve Program on wildlife habitat: results of 1988 monitoring. Transactions of the North American Wildlife and Natural Resources Conference. 54: 365–376.

Jahn, L. R.; Schenck, E. W. 1990. Low-input sustainable agriculture: policy developments and implications for fish and wildlife. Lincoln, NE: National Sustainable Agriculture and Natural Resources Conference. 13 p.

Kirsch, L. M. 1974. Habitat management considerations for prairie chickens. Wildlife Society Bulletin. 2: 124–129.

Kirsch, L. M.; Duebbert, H. F.; Kruse, A. D. 1978. Grazing and haying effects on habitats of upland nesting birds. Transactions of the North American Wildlife and Natural Resources Conference. 43: 486–497.

Krapu, G. L.; Parson, D. R.; Weller, M. W. 1970. Waterfowl in relation to land use and water levels on the Spring Run area. Iowa State Journal of Science. 44: 437–452.

Langner, L. L. 1989. Land-use changes and hunter participation: the case of the Conservation Reserve Program. Transactions of the North American Wildlife and Natural Resources Conference. 54: 382–390.

Leopold, A. 1933. Game management. New York, NY: Scribners. 481 p.

Platts, W. S. 1978. Livestock interactions with fish and aquatic environments: problems in evaluation. Transactions of the North American Wildlife and Natural Resources Conference. 43: 498–504.

Rusch, D. 1990. Pheasants are making comeback in state. Watertown Daily Times. June 20, 1990.

Schenck, E. W.; Arnold, W.; Brown, E. K.; Witter, D. J. 1987. Commercial hunting and fishing in Missouri: management implications of fish and wildlife "markets." Transactions of the North American Wildlife and Natural Resources Conference. 52: 516–524.

Schrader, T. A. 1960. Does Soil Bank aid pheasants? Minnesota Conservation Volunteer. 23: 34–37.

Stauffer, D. F.; Cline, G. A.; Tonkovich, M. J. 1990. Evaluating potential effects of CRP on bobwhite quail in Piedmont Virginia.

Taylor, T. T. 1980. Nesting of ring-necked pheasants in the Texas Panhandle. Lubbock, TX: Texas Tech. University. 35 p. M.S. thesis.

U.S. Department of Agriculture. 1970. Final report of Conservation Reserve Program: summary of accomplishments—1956–1972. Washington, DC: Agriculture Stabilization and Conservation Service. 17 p.

U.S. Department of Agriculture. 1989. The second RCA appraisal. Washington, DC. 280 p.

U.S. Fish and Wildlife Service. 1986. North American waterfowl management plan. Washington, DC.

U.S. Fish and Wildlife Service. 1988. National survey of fishing, hunting and wildlife associated recreation. Washington, DC. 167 p.

Walsh, R. E.; Harpman, D. A.; John, K. H.; McKean, J. R.; LeCray, L. 1987. Wildlife and fish use assessment: long-run forecasts of participation in fishing, hunting and nonconsumptive wildlife recreation. Tech. Rep. 50. Fort Collins, CO: Colorado State University.

Warner, R. E.; Etter, S. L. 1989. Hay cutting and survival of pheasants: a long-term perspective. Journal of Wildlife Management. 53(2): 455–461.

Future Costs and Benefits of Conservation Reserve Lands

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Abstract.—Much conjecture has been focused on both the economic and environmental impacts of cropped farm lands that have been placed in the Conservation Reserve Program (CRP). Many factors, including political and economic decisions, will shape the future costs and benefits of the CRP to landowners and our nation's citizens.

Background

Several events and factors influenced conservation and government leaders as the ideas for the CRP evolved in the early 1980's. At a conservation roundtable led by Agriculture Secretary John R. Block and attended by conservation, government, and farm leaders in 1984 in my farm shop building in southeast Missouri, the CRP concept was thoroughly discussed and supported. The study and subsequent publication by the American Farmland Trust (1984) on the CRP concept added to the logic for government action in converting highly erodible cropland into permanent vegetative cover for at least a 10-year period.

After these initial events, Secretary Block, through personal direct actions and discussions with Office of Management and Budget (OMB) Director David Stockman, convinced the Reagan White House that CRP should be part of the 1985 Farm Bill. Congressional leaders, particularly Congressmen Ed Jones, strongly supported the legislation and the CRP became the law of the land. As we look forward to the many possible scenarios for the future of CRP lands, we need to look at the past history of the "Soil Bank" program of the 1950's and 1960's. There we see that only 20% of the land enrolled in that program stayed in permanent vegetative cover when contracts expired. CRP conversion back to cropland should be lower due to the requirement that conservation plans will hopefully require that converted CRP lands must be cropped only with a conservation plan at the "T" level. (No net loss of soil or productivity.) However, at present this requirement is not absolutely certain.

Future Costs

There are many uncertainties involved in looking at future costs of the CRP. Young and Osborn (1990) examined the possible short-term costs and benefits of the CRP lands. When looking at future costs on a longer basis, there are several basic scenarios to consider:

1. If there are no future payments by the federal government on expired CRP contracts, then there would be more row crop and grass acres in production as contracts expire and land is returned to other economic uses:
   a. The cattle and hay industries could suffer lower prices due to expanded forage acres.
   b. Expanded row crop acres would cause increased production of some row crops (especially small grains) and, therefore, possible negative impact on row crop prices and producers' net income.
   c. Environmental costs to the nation's natural resources would be hard to quantify, but there would be an obvious increase in soil loss on converted CRP acres with a resulting increase in water quality problems in some cases. The loss of wildlife habitat would be real and severe in many cases.
   d. The severity of the impact of these three areas would depend on the involvement in federal farm programs by farmers and the enforcement of conservation compliance by USDA agencies. More farm program participation plus tough enforcement would mean fewer problems with soil loss and water quality and better wildlife habitat.
2. If the federal government provides some type of incentive to keep CRP land in grass and/or trees:
   a. The cattle and hay industry could still have some minor negative impacts if haying and grazing were permitted on these extended CRP contract acres.
   b. There is an obvious cost to the federal treasury (and U.S. taxpayers) when payments are made to extend CRP contracts. These costs would be lessened if farm program base reduction were still in effect and farm program payments were still significant.

3. If the U.S. government is successful at the General Agreement on Tariff and Trade (GATT) with the result being that farm programs play a minor role in producers' cropping decisions, then we could see conservation compliance being less effective; **and**, if we had no economic incentives by the federal government to extend CRP contracts, then we could see the same problems as described in scenario 1.

   However, farmer attitudes on conservation are changing because of increased knowledge and acceptance of farming with reduced tillage and fewer and/or improved herbicides, and a new generation of herbicides that make no-till and reduced tillage more viable, efficient, and environmentally sound.

   Therefore, the negative aspects and impacts of scenarios 1 and 3 should be mitigated by increased farmer awareness of the problems caused by soil erosion.
4. If the federal government under scenario 3 goes further and enacts punitive legislation to enforce some type of legislated conservation compliance with civil penalties and/or other compliance "hooks," then there could be negative economic impacts in the agricultural community depending on the type of compliance restrictions placed in federal laws.

Economics Impacts that May be Positive or Negative

The amount of land in rural communities staying in the CRP with extended contracts should not have any further negative economic impacts on those communities where the maximum acreage is in the CRP, because that adjustment should already have been made. Landowners who have already used CRP land for hunting leases should be able to continue or expand that economic use.

If haying and grazing are allowed on extended contracts, then cattle and sheep numbers could increase with a possible negative impact on their market price; but, conversely, there would be increased sales of livestock and pasture improvement supplies which would stimulate economic activity in some rural areas that have heavy concentrations of CRP grazing and hay land.

It is also possible that any additional supply of beef may well be absorbed by the increased access to the Japanese market as well as U.S. consumer acceptance of lean beef if beef promotion efforts continue to maintain the American consumers' consumption of beef. This might alleviate cattlemen's fears and political pressures against allowing haying and grazing on CRP lands.

If land comes out of CRP under or requirements for conservation plans and goes back into crops or grass under strict conservation plans, then negative impacts on soil loss and water quality will be minimal.

Future Benefits

The degree and magnitude of future benefits depends on scenarios similar to those described under the future costs of CRP lands:

1. If the federal government makes no economic incentives available to CRP contract holders after 10 years, the country has still benefitted from reduced soil loss, a positive impact on water quality, and improved wildlife habitat for 8 to 10 years. In addition, most CRP land that was planted in trees will remain in trees for 10 to 40 more years. These results are hard to concisely quantify, but are definitely positive.
2. If there are some financial incentives by the federal government to keep CRP lands in permanent cover after the original contracts expire, then there obviously will be less soil erosion, improved water quality in some areas, and better wildlife habitat. The magnitude of these improvements to natural resources will depend on whether haying and grazing are allowed and, if allowed, how well they are monitored by government agencies for maximum natural resource benefits while the lands are being used for forage.

   There will be some benefits to the federal treasury if farm programs are still in effect because I suspect that there will have to be a continued reduction in the program base acres that were originally required under the CRP contracts.

   However, the federal government may have to allow continued protection of program crop bases when CRP contracts are extended, because land owner/operators have learned through past experience of the value of these crop bases.

   The continued reduction in crop acres that the CRP lands occupy should have some positive impact on crop prices, although this effect on crop prices may be less important because much of the CRP land is marginal cropland with lower yield potential. Increased technology which will cause higher yields per acre should also offset to some degree the loss of these CRP acres to normal national crop production totals.

   This acreage reduction effect on crop prices will also be mitigated by any federal government policy that requires set-aside acres for prevailing government farm programs.
3. If a farm program (with effective conservation compliance) is still in effect and "T" is required for individual conservation plans, then we will see a positive affect on soil loss reduction and water quality on cropped converted CRP lands.

   Also, by then farmers (with 5 years of conservation compliance in action) should be better conservation farmers on their regularly cropped erodible land, as well as being more inclined to farm converted CRP cropland under strict conservation plans.

   The public will demand that conservation compliance be enforced on any farm program participants, FmHA borrowers, or Federal Crop Insurance participants (if still in place).

   Some of the most erodible CRP land will have to remain in grass for the farm owner/operator to have his/her conservation plan meet strict compliance requirements.

Factors that May Influence Policymakers

Among the many factors that may influence policymakers' decisions on whether to: (1) release CRP lands outright, and/or release under "T", or (2) release CRP lands with payments or other incentives to keep land in grass or trees are the following:

1. The most obvious will be the economic condition of the United States and deficit reduction pressure on decision makers at the time CRP contracts begin to expire.
2. The conservation ethics of key congressional and administration leaders. They obviously will be pressured by conservation and environmental groups to keep this CRP land in grass and/or trees (trees will be costlier for landowners to convert to cropland and so should remain out of crop production).
3. The successful enforcement of conservation compliance by USDA agencies will help convince policymakers and pressure groups alike that converted farmable CRP cropland can and will be farmed at the "T" level of soil loss. This also presumes that farm programs and government agency lending are still in place, and that "T" will be required on converted CRP cropland. If a poor USDA enforcement effort is visible, then there may be reluctance to release this highly erodible land back to a degradable condition.
4. A visible and obvious change to genuine conservation tillage by a majority of farmers on erodible land may also give Congress and interest groups more comfort in releasing farmable CRP land back to crop production. This will require a change in attitude by many farmers and some extension leaders, but it does appear to be happening in most areas of the country.

Conclusion

The benefits to our country of the CRP program for the future have to be considered as positive. The CRP payments themselves have enabled many financially stressed farmers and ranchers to stay in business, most of them permanently.

The net cost to the federal government in dollars is much less than the appropriated (and publicized) gross cost, due to the reduction in farm program payments on CRP land which had been in program crops.

The long-term benefit to wildlife, because of more and better habitat, will be positive but hard to quantify in dollars, but easily seen by farmers, sportspersons, and wildlife agencies. Most CRP land placed in trees should remain in that cover until those trees mature to harvestable age. This has obvious positive economic impact due to the value of the timber or pulpwood as well as the continued positive impacts on water quality and soil erosion while the trees are growing.

Finally, the direct reduction in soil loss on all CRP acres and the resulting increase in water quality in many areas has caused permanent reductions in the degradation of these natural resources.

Literature Cited

American Farmland Trust. 1984. Future policy directions for American agriculture. Washington, DC.

Osborn, Tim; Konyar, Kazim. 1990. A fresh look at CRP. Agricultural Outlook. Aug.1990/OA-166.

Young, C. Edwin; Osborn, C. Tim. 1990. The Conservation Reserve Program: an economic assessment. AER 626. U.S. Department of Agriculture, Economic Research Service.

Impacts of the Conservation Reserve Program in the Central Great Plains

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Abstract.—The primary goal of the CRP is to remove highly erodible and environmentally sensitive cropland from crop production by entering into 10-year contracts between the USDA and the producer. This goal is being achieved in the central Great Plains region since almost one-fourth of the total acres enrolled in the CRP come from this area (CO, KS, NE, OK, and WY). The main economic impact will result from the stability of the income derived from the CRP annual rental payments. The total annual rental payment in just the central Great Plains amounts to $365,217,677 per annum. Economic impacts will result from tax dollars saved due to the reduced production of commodity crops and the resulting cost savings on loan storage costs, guaranteed price supports, deferring payments, and other USDA farm program payments. However, the net USDA CRP expense nationally is projected at $2.0 to $6.6 billion. Environmental impacts in the central Great Plains will be clearly beneficial. The net erosion reduction on the land established in permanent vegetation will amount to 154,961,573 ton per year. Wildlife populations such as deer, antelope, gamebirds, and raptors will benefit from increased habitat. Using a cost versus benefit basis to indicate whether the social benefits of the CRP warrant the social costs, the present value of net benefits from the CRP could range from $3.4 to $11.0 billion. An estimated 80% of CRP program acreage may revert to cropland unless incentives, program policies, and guidelines or economic forces are changed from present scenarios. Six options for enhancing CRP land stability are reviewed along with impacts and support needs of USDA SCS in initiating such program changes.

Introduction

The Conservation Reserve Program (CRP) became law with the passage of the 1985 Farm Bill (Public Law 99–198), also known as the Food Security Act (FSA) of 1985. More than any other piece of farm legislation, the FSA will have significant impacts on the economics, social aspects, and natural resources of this country. This will be true primarily because of the CRP provisions of the Act.

The primary goal of the CRP is to remove highly erodible and environmentally sensitive cropland from crop production by entering into 10-year contracts between the USDA and the producer. Under the CRP contract, the participant is required to establish a permanent vegetative cover (herbaceous and/or wood vegetation) as quickly as is feasible, for which approximately half of the cost is shared by USDA. This goal is being achieved in the central Great Plains region since almost one-fourth of the total acres enrolled in the CRP come from this area (Colorado, Kansas, Nebraska, Oklahoma, and Wyoming). Other impacts of the CRP in the central Great Plains region need to be described in order to gain full appreciation of this far reaching program. These include the economic, environmental, and social impacts from the CRP. Given these significant impacts of the CRP in the central Great Plains, six options are presented for Conservation Reserve lands preservation.

Economic Impacts

The main economic impacts from the CRP will result from the stability of the farm income derived from the

annual rental payments. The central Great Plains region is characterized by wide fluctuations in annual crop yields due to environmental extremes and highly variable soils. In Colorado alone, over the last 10 years, dryland winter wheat yields have varied from 25 bushels per acre in 1979 to a high of 37.5 bushels per acre in 1985 (Colorado Department of Agriculture 1990). Crop yields in each state in this region are also variable (table 1). The total annual rental payment (USDA SCS 1990) in the central Great Plains amounts to $365,217,677. This is based on per acre rental rates of a low of $38.43 in Wyoming to a high of $55.45 in Nebraska (table 2).

Nationally, the economics of the CRP point toward a net government CRP expense of $2.0 to $6.6 billion (table 3). Following the 1988 drought, this increased to $9.7 billion (Ervin and Osborn 1990). Government cost savings are due to the direct and indirect results of reduced loan storage costs (Commodity Credit Corporation), as well as lowered costs for the traditional USDA supply control programs. In the central Great Plains area, a total of 5,154,900 acres of commodity base have been retired by the CRP (table 2) with the 3,182,229 acres of wheat base reductions being the most affected (USDA SCS 1990). Other commodity base acreage reductions in the central Great Plains are shown in table 4. The realized net government cost of the CRP will depend greatly on the actual level of the USDA commodity control programs.

Finally, the direct economic effects on CRP participants will be cost reductions in farming enterprises due to the conversion of cropland to grasses and trees. However, participant cost inputs in the central Great Plains area are required for seedbed preparation, seed and seeding of a cover crop (generally a warm season sorghum crop), seed and seeding of the permanent vegetation, and multiple weed control events for successful permanent cover establishment. These CRP costs are, for the most part, equally shared between the participant and USDA with the exception of subsequent weed control efforts.

Environmental Impacts

The largest environmental benefits of the CRP will come from improvements in wildlife habitat and surface water quality in the United States (Ervin and Osborn 1990). This will be equally true in central Great Plains where, due to the CRP practice applications (table 5), positive impacts will occur to wildlife populations such as mule and whitetail deer, antelope, gamebirds such as dove and quail, small mammals, songbirds, and raptors. Sediment reduction and water quality improvement in the central Great Plains will be the direct result of a net annual erosion reduction of 154,961,573 tons of soil (table 2) that would have otherwise been lost with the permanent vegetation on the Conservation Reserve lands (USDA SCS 1990). This erosion reduction represents 24% of the total soil savings in the entire United States as a result of CRP.

Table 1.—Crop yield by state in the central Great Plains area.

State	Wheat (bu)	Corn (bu)	Barley (bu)	Oats (bu)	Sorghum (bu)	Cotton (lbs)
CO	24	87	30	32	22	
KS	30	90	36	41	43	331
NE	33	88	39	44	65	
OK	25	88	31	38	30	286
WY	27	75	33	32	22	

Source: USDA SCS 1990.

Table 2.—Summary of the CRP activity in the five states of the central Great Plains. Based on signup numbers 1 through 9.

State	Land under contract (ac)	Total annual rental payment ($)	Rental rate per acre ($)	Net erosion reduction (tons/yr)
CO	1,953,042	80,307,597	41.12	48,373,834
KS	2,861,786	151,144,575	52.81	46,499,899
NE	1,348,929	74,801,817	55.45	30,234,603
OK	1,155,450	49,085,176	42.48	26,495,577
WY	257,022	9,878,512	38.43	3,357,660
Totals	7,576,229	365,217,677		154,961,573
% entire program	22%	22%		24%

Source: USDA SCS 1990.

Table 3.—Government expenditures and cost savings for the CRP.

Category	Value billion $
Gross government expenses	
CRP program costs	
Rental payments	(19.5 to 20.8)
Corn bonus	(0.3)
Establishment cost share	(1.6)
Technical assistance	(0.1)
Gross government cost savings	
CCC cost savings	
Direct	10.2 to 12.2
Indirect (price effect)	6.0 to 7.3
Net government CRP expense	2.0 to 6.6

Source: Ervin and Osborn 1990.

Secondary environmental benefits in the central Great Plains will result from reduced pesticide usage on formerly cropped acreage and from improved ground water recharge into underground aquifers such as the Ogalalla.

There has been some concern that the increase in CRP revegetated acres will accordingly increase the habitat and potential population of insects. Some build-up or documented evidence of insects, such as grasshoppers or Russian wheat aphids, inhabiting CRP areas and certain host grasses has been noted. However, there is no evidence on an overall basis, of any more or less potential damage by insects, in relation to populations prior to the land use conversion. More specifically, Russian wheat aphids have been found in CRP fields, as well as cropped wheat, in any given area. Accordingly, Colorado State University Extension Service specialists have concluded that there is no Russian wheat aphid build-up due specifically to CRP in southeast Colorado (Peairs 1987).

Project Impacts on Society

The impacts of the CRP on a social basis can be difficult to grasp due to the many variables involved. Clearly any large scale return, after contracts expire, of CRP acreage to annual crop production would not be in the best interest of the citizens of this country and obviously a detriment to our natural resource base.

When examined on a cost versus benefit basis, an indication can be made as to whether the social benefits of the CRP warrant the social costs. Estimating values for the potential real resource benefits and cost of a 45-million-acre CRP, the present value of net benefits could range from $3.4 to $11.0 billion (Young and Osborn 1990).

Even with less than target enrollment in the CRP, the net benefits for just the central Great Plains States should be commensurate with the figure for a national 45-million acre CRP.

Table 4.—Base acreage reduction as a result of the CRP in the central Great Plains. Based on signup numbers 1 through 9.

State	Wheat (ac)	Corn (ac)	Barley (ac)	Oats (ac)	Sorghum (ac)	Cotton (ac)
CO	803,076	25,621	92,254	13,179	185,125	
KS	1,265,724	55,911	72,299	63,409	644,854	183
NE	312,479	336,779	33,782	78,713	123,142	
OK	696,612	5,282	6,624	15,329	143,187	60,165
WY	104,338	1,937	8,928	9,865	103	
Total	3,182,229	421,530	213,887	180,495	1,096,411	60,348

Source: USDA SCS 1990.

Table 5.—Selected practices applied for the CRP in the central Great Plains. Based on signup numbers 1 through 9.

State	Tree plantings (ac)	Introduced grass (ac)	Native grass (ac)	Wildlife plantings (ac)
CO	642	545,428	1,329,419	70,536
KS	2,897	233,679	2,589,452	17,954
NE	2,943	572,950	483,041	269,363
OK	1,124	681,225	452,066	1,583
WY	8	210,646	404	42,370

Source: USDA SCS 1990.

The CRP program is significantly impacting the local areas where program maximum land conversion has or is occurring. Generally, those counties where a program maximum 25% of cropland was entered into CRP the impacts on the communities are most extensive.

In some communities, basic agricultural service industries were impacted with reduced revenues, i.e., fertilizer, farm equipment, and commodity businesses. But overall, the evidence does not support general negative impacts on local communities due to CRP. A redistribution of local financial activities from one type of agricultural service may be more the general effect. Local grass seed dealers, farm contractors, and financial institutions would be expected to have benefited by the program. Sales tax increases, ownership tax revenues, increased in Baca County, Colorado, where 267,000 acres went into CRP and many agricultural services, such as fertilizer use, were not significantly affected or were actually increased (Myers and Sutherland 1989).

CRP Options Following Contract Expiration

Thirty-four million acres of Conservation Reserve Program land will be eligible for conversion to cropland beginning in 1996. With present program rules and projected commodity economic environments, a significant majority of that CRP land will be converted to annual crop production. To remain in compliance with USDA programs, that land will require a conservation plan that meets existing USDA SCS field office technical guides. Options for impacting the acreage of CRP lands that remain in a permanent or sustainable environment include plowout disincentives, USDA program commodity base protection, CRP contract extension, economic use incentives, conservation easements, and state or local land use regulations. Each of these options will require legislative action to initiate effective change in current program environments. Without action, 80% of the CRP acreage is projected to return to annual crop (Heimlich and Kula 1989).

The overwhelming majority of CRP acres are planted to perennial grasses and generally assumed to be easily converted to cropland at the end of 10-year contracts. CRP acreage planted to trees have less propensity for conversion, but that acreage is very small (6.4%) and concentrated mostly in southeastern states. The wind erosion prone central Great Plains states have a high chance of plowout.

Under most scenarios, there will be significant administrative responsibilities for USDA SCS as the CRP contracts expire. Plowout disincentives, economic use incentives, and conservation easements would require preparation of many in-depth resource plans for producers as contracts expire. Commodity base protection, contract extension, and regulated land uses will suggest certain plan attention, though not as intensive as the other options. Generally, appropriate planning time for producer decision making will be equivalent to or greater than that involved in the original CRP plan for most options, in order to realize the long-term benefits of the CRP program.

Summary

The Conservation Reserve Program will have far reaching impacts on the economic, environmental, and social aspects of the United States. In the central Great Plains States of Colorado, Kansas, Nebraska, Oklahoma, and Wyoming, the most significant environmental benefits will result due to the improvement of wildlife habitat, surface water quality, and ground water quantity. The social impacts in the central Great Plains area can be extrapolated to be beneficial due to the positive net program benefits of the CRP. These beneficial impacts of the CRP cannot be realized without an associated economic cost to the USDA. Clearly, the beneficial impacts of the CRP in the central Great Plains outweigh the relatively small cost involved. However, faced with the possibility of only 20% of the Conservation Reserve lands remaining in permanent vegetation after the contracts expire, the longevity of these benefits will depend greatly on future USDA policy actions beginning with the 1990 Farm Bill.

Literature Cited

Colorado Department of Agriculture. 1990. Colorado agricultural statistics. Lakewood, CO: Colorado Agricultural Statistics Service.

Ervin, D.; Osborn C. T. 1990. Conservation Reserve Program: operation, performance and issues. Washington, DC: U.S. Department of Agriculture, Economic Research.

Heimlich, R.; Kula, O. E. 1989. Grazing lands: how much CRP land will remain in grass? Rangelands. 11(6): 253–257.

Myers, S. O.; Sutherland, P. L. 1989. CRP: a Baca County, Colorado perspective. Journal of Soil and Water Conservation. September-October 1989: 431–436.

Peairs, F. 1987. Insect populations in CRP. Colorado State University, Cooperative Extension, Fort Collins, Colorado. [Letter to J. Knapp.]

U.S. Department of Agriculture, Soil Conservation Service. 1990 Conservation Reserve Program summary. Nat. Bull. No. 300-0-8. Washington DC: U.S. Department of Agriculture, Soil Conservation Service.

Young, C. E.; Osborn C. T. 1990. Costs and benefits of the Conservation Reserve Program. Journal of Soil and Water Conservation. 45(3): 370–373.

Research Questions Related to the Conservation Reserve Program

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Abstract.—Thirty-four million acres of highly erodible land have been enrolled in the Conservation Reserve Program through the ninth signup. We sent a questionnaire to individuals involved with the program. The questionnaire addressed eight research hypotheses. Respondents identified additional research needs in the areas of ecological succession, economics, biodiversity, and sociology. There is a need to summarize research results and transfer the information to decision makers.

Introduction

Title XII of the Food Security Act of 1985 started several conservation programs including Sodbuster (Subtitle B), Swampbuster (Subtitle C), and the Conservation Reserve Program (CRP) (Subtitle D). Anticipated conservation benefits of CRP include a reduction in erosion and sedimentation, improvement of water quality, and improvement in wildlife habitat. Other possible benefits are reductions in commodity production, reductions in ongoing commodity programs, and increases in commodity prices.

Through the ninth signup, almost 34 million acres had been enrolled in CRP (USDA ASCS 1990). Numerous studies have been conducted and reported in journals, books, and proceedings of symposia such as this one. Two references have specifically addressed research needs related to CRP. Mitchell and Evans (1988) identified knowledge gaps related to ecology, economics, and sociology. They recommended that a central organization, such as the USDA, establish research priorities, acquire funding, and monitor research progress. A task force of the Council for Agricultural Science and Technology (CAST) made more specific recommendations for needed research (Council for Agricultural Science and Technology 1990). The CAST report identifies numerous areas of research including:

1. Determining the impact on weed populations.
2. Determining the effect of the new agroecosystems on plant pathogen, nematode, rodent, and insect populations.
3. Delineating the influence of land use diversification on water quality, soil stability, and biological diversity.
4. Determining the effects of land management programs on wildlife.

The purpose of our study was to determine areas of needed research in the biological and social sciences. We specifically addressed researchable questions.

Methods

We prepared a questionnaire (appendix) which was composed of null hypotheses relating to researchable problems followed by a number of yes-no questions. Eight hypotheses were included along with the types of information needed to test them (table 1). We developed the hypotheses from our knowledge of the CRP and from discussion with scientists and agency personnel. The set of hypotheses is not intended to be inclusive of all possible hypotheses. Respondents were allowed to skip questions as the questionnaire was sent to both researchers and agency personnel. Opportunities were provided for comments and identification of other research topics.

The questionnaire was sent to authors of articles on the CRP and the Food Security Act of 1985, and to state conservationists and state range conservationists of the Soil Conservation Service (SCS). The list of authors was developed from three publications:

1. Implementing the Conservation Title of the Food Security Act of 1985 (Napier 1990).

Table 1.—Hypotheses included in the questionnaire.

Number	Hypothesis
I	Long-term protection from grazing does not alter seeded grassland ecosystems.
II	Successional dynamics of cropland seeded to native and introduced grass species and mixtures of species are not understood.
III	Erosion rates at the (1) pasture and (2) landscape levels are not reduced by the CRP.
IV	The biological diversity of CRP-modified landscapes has not changed.
V	The CRP does not impact the economic efficiency of participants and society.
VI	The economic impact of the CRP on rural communities has been insignificant.
VII	The physiological and autecological bases for establishing permanent vegetation on the High Plains is not understood.
VIII	Grazing management practices have no significant effect on wildlife habitat suitability of CRP lands.

2. Impacts of the Conservation Reserve Program in the Great Plains: Symposium Proceedings (Mitchell 1988).
3. The September–October 1989 issue of the Journal of Soil and Water Conservation (Soil and Water Conservation Society 1989).

A total of 214 questionnaires were sent with 62 (29%) being returned. There was no intent to obtain a statistically valid sample of people concerned with CRP. Rather, we were seeking ideas on the hypotheses that we proposed.

Results

Thirty-six SCS employees and 26 authors from universities and other agencies returned the questionnaire. The responses of the two groups to the questions were similar in most instances. The following results are for all respondents unless otherwise specified. Several SCS respondents stated that there was not land enrolled in CRP in their state. One SCS employee stated:

> Our approach to data collection and monitoring CRP lands for ecological and economic dynamics is embarrassingly weak. As far as I know, there was never a master plan developed to include any data collection for decision making.

Hypotheses I and II

The first two hypotheses related to successional dynamics of CRP seedings. The questions and percent of yes and no responses related to these hypotheses are shown in table 2. The majority of respondents stated that they had county or state summaries of the CRP. More Soil Conservation Service employees responded positively than did non-SCS respondents. A third reported that the summaries were organized by species or combination of species while only 3 of 41 responded that the summaries were classified by range sites. Twenty-three of the summaries could be retrieved via a computer while 24 were written summaries.

Only one-third of the respondents monitored or had plans to monitor the status of CRP seedings. The most common items monitored were species composition and total cover. Other items that were mentioned included early and first-year plant densities, use by upland nesting waterfowl, basal area, stand success related to cover crop and seeding method, and potential for conversion to pasture. In most cases, SCS only monitors CRP seedings until the stands are established.

Most did not keep similar records on non-CRP pastures. Those that did kept records on the basis of species and range site. Only six of those who did not monitor knew of other monitoring efforts. The Agricultural Conservation and Stabilization Service (ASCS) and the SCS were identified as were universities and USDA Forest Service. One respondent thought that the U.S. Fish and Wildlife Service might have monitoring data. An SCS respondent said that records of many seedings can be obtained from SCS plant material specialists.

Only one-fifth plan to monitor the status of CRP lands after the contracts expire. Several university scientists are planning to monitor farms with land in CRP. Most of those who responded that they would monitor are only in the planning stage as the first contracts will not expire until 1996. Most respondents do not have plans to identify and monitor burning, mowing, or grazing during the CRP contract period.

Hypothesis III

The question that was asked concerning the erosion related hypothesis concerned whether or not the present data sources and models are sufficient to describe erosional and depositional process on landscapes. The majority (81%) felt that they were not. Of those that thought the data and models adequate, comments indicated that it was a relative question of erosion before being enrolled in CRP compared to erosion after seeding establishment. These people felt that the answer was obvious; erosion decreased.

Many were not confident in the Universal Soil Loss Equation which has been used on CRP land. They also

Table 2.—Response to questions concerning hypotheses I and II.

Question	N	Percentage Yes	Percentage No
Do you have county or state summaries of lands seeded to grassland under the CRP?	53	72	28
Are they by species/species combination?	43	33	67
Are they by range site?	41	7	93
Do you monitor or have plans to monitor the status of CRP grasslands?	54	33	67
If so, does your monitoring plan measure			
1. species composition?	14	86	14
2. production?	13	54	46
3. total cover?	18	83	17
4. frequency?	14	36	64
Do you keep records of similar non-CRP pastures maintained under grazing management?	56	18	82
If so, are they by species/species combination?	10	100	0
are they by range site?	10	70	30
If not, do you know the availability of such data from other organizations or agencies?	47	13	87
Do you have a plan to monitor the status of CRP lands as the contracts end?	55	22	28
Do you have a plan to identify and/or monitor implementation of burning, mowing, or grazing (if allowed) practices on CRP lands while they are under contract?	55	31	69

felt that new models were being developed that better address the erosion question. Some thought that the new models would require data that will not be available or that the models would not function at the landscape level. One respondent argued that we have enough information about physical processes and that we needed more information on sociological factors.

Hypothesis IV

This hypothesis concerned biological diversity on areas with CRP lands. Most respondents did not know of studies on animal populations in relation to the amount of land entered into the CRP (table 3). Of those who knew of studies, only a few were actually doing studies and others were not specific in their responses. Many reported that the state wildlife agencies were monitoring wildlife populations, but not necessarily as they were related to CRP. Several referred to a study in South Dakota pertaining to upland nesting of waterfowl use of CRP lands. The South Dakota researchers also monitored pheasant and white-tailed deer use, but no reference to the literature was provided. Several respondents provided the names of individuals who are working in this area.

Concerning the study by the U.S. Fish and Wildlife Service and state wildlife agencies, most of those who returned their questionnaire were not aware of the study. Only six felt that the study was adequate to determine changes in animal biodiversity. Others explained that the number of species included in the study was not adequate to address questions about biodiversity.

Hypotheses V and VI

These hypotheses related to economic analyses. Hypothesis V concerned economic efficiency, and VI concerned economic impacts of CRP (table 1). Over half (54%) kept records of the cost of establishing CRP plantings while only one-third kept records on maintenance costs. The most common comment was that the ASCS had establishment costs or that the information was located at the local SCS office.

Thirty percent of 47 responding to the question said that research had been done on the economic efficiency of CRP plantings. Only five felt that the studies were adequate. One individual commented that enrollment of cropland in CRP released labor and capital to be used on other cropland or in other enterprises.

Eighty-six percent of the respondents felt that there is not adequate information on the economic impact of the CRP at the county or state level. One referred to work at Oklahoma State University (Dicks et al. 1990). Seventy-seven percent thought that there should be more effort to determine the economic impact of CRP. Several referred to work in North Dakota and Montana (Johnson 1990, Mortensen et al. 1989, Standaert and Smith 1989). Several commented that CRP impacts would be difficult to separate from impacts of other agricultural programs. It was noted that the weakness in such studies was assigning values to nontangible benefits such as watershed protection, soil erosion, and wildlife. Projections for what will happen to economies after CRP contracts expire are needed. One respondent felt that economists from the Economic Research Service and

Table 3.—Responses to questions concerning Hypothesis IV on biodiversity.

Question	N	Percentage Yes	Percentage No
Are there any studies that monitor a number of animal populations on CRP lands as these grasslands become established?	50	22	78
Are similar animal populations on associated non-CRP lands, including cropland, being monitored:	46	13	87
Are mobile animal populations, such as birds, being monitored at the landscape level in areas modified by CRP lands?	46	22	78
Is the cooperative study between USF&WS and state wildlife agencies adequate to determine changes in animal biodiversity due to CRP?	24	25	75

land grant universities have explored economic impact thoroughly.

Hypothesis VII

This hypothesis dealt with the adequacy of knowledge concerning the establishment of CRP plantings. Eighty-three responded that research or experience provided information that cover crop selection is an important criterion in establishing permanent vegetation on former cropland. Only 49% felt that the effects of various seedbed preparation techniques on grass and shrub establishment was adequately understood. One respondent commented that the knowledge exists, but the training and educational programs are inadequate.

Approximately 50% felt that the requirements for water, nutrients, temperature, and light were adequately understood for important grass and shrub species used on CRP lands. Some thought that this information was adequate but that it was not adequately applied. Shrub species that were identified as requiring further research were fourwing saltbush (*Atriplex canescens*) and winterfat (*Ceratoides lanata*). Grass species included western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass (*A. spicatum*), tobosa (*Hilaria mutica*), galleta (*H. jamesii*), blue grama (*Bouteloua gracilis*), black grama (*B. eriopoda*), sideoats grama (*B. curtipendula*), needle-andthread (*Stipa comata*), green needlegrass (*S. viridula*), switchgrass (*Panicum virgatum*), alkali sacaton (*Sporobolus airoides*), Indiangrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*), and little bluestem (*Schizachyrium scoparium*).

Hypothesis VIII

This hypothesis concerned the relationship between grazing management practices and wildlife habitat (table 1). Forty-three percent reported that they were aware of research that evaluates the response of wildlife to the implementation of high-intensity grazing systems. Respondents stated that research was occurring in Texas, North Dakota, and Colorado.

Thirty-four responded to the final question which asked if the factors influencing habitat values in relation to livestock grazing were ecological or sociological in nature. One-third of the respondents thought both were important while 16 thought the factors were ecological. Only seven thought that the factors were only sociological.

Discussion

Summaries of information on CRP plantings are very general and loose much of the detail concerning successes and failures. The need for continued monitoring after seeding establishment is recognized but is only planned by university scientists or as incidental observations by SCS personnel. One SCS employee summarized the need by responding:

> I believe we have with CRP provided a laboratory full of information concerning the do's and don't's of vegetation re-establishment. We would be remiss in our duties if we don't gather and publish it for the next program, when most of us will be retired.

Although most felt that models of erosion processes were inadequate, it appears that there is sufficient research addressing this topic. New models that were identified by respondents may not address erosion questions at the landscape level. A few pointed out that erosion is a very site specific process.

Biological diversity is a popular topic. Research is not being conducted to investigate the impact of the CRP on the biodiversity of plant and animal species. Research is needed that relates biodiversity to the mosaic of land uses including land enrolled in the CRP.

Economic efficiency is important on an individual basis. Few, if any, would have entered into CRP contracts if they believed that the CRP was not an economically efficient alternative. Young and Osborn (1990) estimated that the net benefit of the CRP was 3.4 to 11.0 billion dollars. Their study provides a starting point to estimate the net benefit to society from the CRP. Shoemaker (1989) examined the impact of the CRP on land values and rents; similar research needs to be continued in the 1990's.

Determining the economic impact of the CRP was identified as an important research topic. Studies have been conducted which examined this question in various

parts of the country. The need is for coordinated efforts which use common methodology to aggregate impacts from the local level to the state and national levels.

Finally, respondents pointed out the need to project what will happen after the CRP contracts expire. Heimlich and Kula (1990) anticipated that no more than 20% of the land in the CRP to remain in grass after the program ends. As one respondent pointed out, our questionnaire did not address the important sociological studies that are needed. To address the future of CRP land use, behavioral and motivational studies of land owners are needed.

Many studies have been and are being conducted. The need is to relate this information to land owners, government employees, and Congress. Napier's (1990) work and this symposium provide mechanisms to compile and summarize information on the CRP. Similar efforts will be needed in the future.

Literature Cited

Council for Agricultural Science and Technology. 1990. Ecological impacts of federal conservation and cropland reduction programs. Rep. No. 117. Ames, IA: Council for Agricultural Science and Technology Task Force. 28 p.

Dicks, Michael R.; Hyberg, Bengt; Hebert, Thomas. 1990. Implications of current and proposed policies for America's rural economies. In: Napier, Ted L., ed. Implementing the conservation title of the Food Security Act of 1985. Ankeny, IA: Soil and Water Conservation Society: 51–66.

Heimlich, Ralph E.; Kula, Olaf E. 1990. Grasslands: the future of CRP land after contracts expire. Journal of Products Agriculture. 3(1): 7–12.

Johnson, James B. 1990. The Conservation Reserve Program's effects on participating farms and Montana's economy. Montana Ag Research Summer/Fall. 1990: 20–25.

Mitchell, John E., ed. 1988. Impacts of the Conservation Reserve Program in the Great Plains: proceedings of a symposium; 1987 September 16–18; Denver, CO. Gen. Tech. Rep. RM-158. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 134 p.

Mitchell, John E.; Evans, Gary. 1988. A prospectus for research needs created by passage of the Conservation Reserve Program. In: Mitchell, John, ed. Impacts of the Conservation Reserve Program in the Great Plains: proceedings of a symposium; 1987 September 16–18; Denver, CO. Gen. Tech. Rep. RM-158. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 128–132.

Mortensen, Timothy L.; Leistritz, F. Larry; Leitch, Jay A.; Coon, Randal C.; Ekstrom, Brenda L. 1989. Landowner characteristics and the economic impact of the Conservation Reserve Program in North Dakota. Journal of Soil and Water Conservation. 44(5): 494–497.

Napier, Ted L., ed. 1990. Implementing the conservation title of the Food Security Act of 1985. Ankeny, IA: Soil and Water Conservation Society. 363 p.

Shoemaker, Robbin. 1989. Agricultural land values and rents under the Conservation Reserve Program. Land Economics. 65(2): 131–137.

Soil and Water Conservation Society. 1989. Journal of Soil and Water Conservation, September-October issue. 44(5): 356–544.

Standaert, James E.; Smith, H. Arlen. 1989. CRP effects on Montana's economy. Journal of Soil and Water Conservation. 44(5): 507–509.

U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service. 1990. Conservation Reserve Program logo package, January 22. 10 p.

Young, C. Edwin; Osborn, C. Tim. 1990. Costs and benefits of the Conservation Reserve Program. Journal of Soil and Water Conservation. 45(3): 370–373.

Appendix: Questionnaire

The Conservation Reserve Program:
An Opportunity for Ecological and Economic Research

I. **Hypothesis I: Long-term protection from grazing does not alter seeded grassland ecosystems.**

Hypothesis II: Successional dynamics of cropland seeded to native and introduced grass species and mixtures of species are not understood.

Information Needed: Records on species planted
- a. Native mixtures by range site
- b. Introduced mixtures by range site

Information on monitoring of these pastures
- a. Species composition
- b. Total cover/production

Questions:

1. Do you have county or state summaries of lands seeded to grassland under the CRP? **Yes** **No**
2. Are they by species/species combination? **Yes** **No**
3. Are they by range site? **Yes** **No**
4. How may such summaries be retrieved?
   a. computer files
   b. written

5. a. Do you monitor or have plans to monitor the status of CRP grasslands? **Yes** **No**
   b. If so, does your monitoring plan measure
   - (1) Species composition? **Yes** **No**
   - (2) Production? **Yes** **No**
   - (3) Total cover? **Yes** **No**
   - (4) Frequency? **Yes** **No**
   - (5) Other (Please describe)

6. Do you keep records of similar non-CRP pastures maintained under grazing management? **Yes** **No**

   If so, please answer questions 7–9

7. Are they by species/species combination **Yes** **No**
8. Are they by range site? **Yes** **No**
9. How may such summaries be retrieved?
   a. Computer files
   b. Written
10. If not, do you know of the availability of such data from other organizations or agencies? **Yes** **No**

    If yes, please list the organization/agency.

11. a. Do you have a plan to monitor the status of CRP lands as the contracts end? **Yes** **No**
    b. If so, please briefly describe plan below or attach photocopy of plan.

12. Do you have a plan to identify and/or monitor implementation of burning, mowing, or grazing (if allowed) practices on CRP lands while they are under contract? **Yes** **No**

II. **Hypothesis III: Erosion rates at the (1) pasture and (2) landscape levels are not reduced by the CRP.**

Information Needed: Wind and water erosion rates for indicidual blocks of land in landscapes from models and empirically.

Note: Landscapes are defined here as assemblages of ecosystems comprising two to four orders of magnitude more area than individual ecosystems, eg. if CRP blocks are 600 acres, the landscape would be 60,000 + acres.

Questions:

13. Are present data sources and models sufficient to describe erosional and depositional processes on landscapes containing various proportions and spatial distributions of CRP lands? **Yes** **No**

    Comments:

III. **Hypothesis IV: The biological diversity of CRP-modified landscapes has not changed.**

Information Needed: Estimates of plant community composition and associated annual populations early in CRP contract period and later, OR some measure of population dynamics of key plant and animal species.

Appendix: Questionnaire

The Conservation Reserve Program:
An Opportunity for Ecological and Economic Research—Continued

Questions:

14. Are there any studies that monitor a number of animal populations (including reptiles, small mammals, insects, etc.) on CRP lands as these grasslands become established? **Yes** **No**

    If so, briefly describe.

15. Are similar animal populations on associated non-CRP lands, including cropland, being monitored? **Yes** **No**

    If so, briefly describe.

16. Are mobile animal populations, such as birds, being monitored at the landscape level in areas modified by CRP lands? **Yes** **No**

    If so, briefly describe.

17. a. Is the cooperative study between USF&WS and state wildlife agencies adequate to determine changes in animal biodiversity due to the CRP? **Yes** **No**

    b. If not, how could this effort be modified by additional research funds to address this subject? Explain briefly, including level of funding needed within order of magnitude.

IV. Hypothesis V: The CRP does not impact the economic efficiency of participants and society.

Information needed: Costs of establishment and maintenance of permanent cover, loss of net income from crops, rate of establishing, income from payments, changes in labor costs and taxes, etc. Present net worth.

Questions:

18. Do you deep records of establishment costs of CRP plantings? **Yes** **No**

19. Do you keep records of maintenance costs? **Yes** **No**

20. a. Has research been done on the economic efficiency of CRP plantings (present net worth)? **Yes** **No**

    b. Are these studies adequate? **Yes** **No**

    c. Comments:

V. Hypothesis VI: The economic impact of the CRP on rural communities has been insignificant.

Information needed: Data on agricultural business activities in early versus late 1980's, demographics of farms and towns in areas impacted/ not affected by the CRP, foreclosures for taxes and loan departments in same areas.

Questions:

21. Is there adequate information on the economic impact of the CRP in your county and/or state? **Yes** **No**

22. a. Should more effort be made to determine the economic impact of the CRP? **Yes** **No**

    b. Comments:

VI. Hypothesis VII: The physiological and autecological bases for establishing permanent vegetation on the High Plains is not understood.

Information needed: Basic ecological data on interactions between environmental/management factors (eg. kinds of cover crop, weed control, etc.) and vegetation response.

Questions:

23. Does research or experience provide information that cover crop selection is an important criterion in establishing permanent vegetation on former cropland? **Yes** **No**

24. Are the effects of various seedbed preparation techniques on grass and shrub establishment adequately understood? **Yes** **No**

25. a. Are the requirements for water, nutrients, temperature, and light adequately understood for important grass and shrub species used on CRP lands? **Yes** **No**

    b. If not, list species which you believe should be studied further.

VII. Hypothesis VIII: Grazing management practices have no significant effect on wildlife habitat suitability of CRP lands.

Note: Grazing is not presently allowed on CRP lands.

Information needed: Measurements of changes in wildlife habitat values following implementation of various grazing management practices.

Questions:

26. Are you aware of any research that evaluates the response of wildlife to implementation of high-intensity grazing systems?
Yes **No**

27. Are the primary factors influencing wildlife habitat values in relation to livestock grazing of an ecological (eg., competition for forage) or a social (eg., grazing animal behavior, influences on territorial nature of some wildlife species) nature?

a. Ecological
b. Sociological

Some Sociological and Ecological Effects of the Conservation Reserve Program in the Northern Great Plains

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Abstract.—The Conservation Reserve Program (CRP) in the northern Great Plains reduces soil erosion and improves quality of water, air, and wildlife habitat but may have positive or negative economic impacts to agriculture. Generally, net farm income is raised but small decreases may occur in state and local business economies. Effects of emergency haying of CRP fields on duck production is compared between strip and block treatments.

Introduction

As of July 1990, over 11 million acres of Conservation Reserve Program (CRP) lands have been planted to grassland or woodland habitat in Montana, Minnesota, North Dakota, South Dakota, and Nebraska (table 1). This extensive conversion of previously farmed lands to perennial grassland and woodland is creating numerous positive and negative environmental and socioeconomical impacts. Because of a low regional population density, major changes in agricultural policies have far reaching impacts. Uncertainties and predictions of some probable impacts were projected during a CRP symposium in 1987 (Mitchell 1988).

The purpose of this paper is to focus attention on some general socioeconomic effects on the regional population and some specific environmental effects on select wildlife species since the 1987 CRP symposium. Recommendations for emergency haying and procedures for rejuvenating grassland habitats will also be presented.

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Socioeconomic Impacts

Effects of farm programs are often difficult to assess and may vary widely throughout individual states, counties, and communities. Nationwide, CRP will generate

Table 1.—Land area planted to CRP grassland or woodland, and area of wetlands in CRP fields in the northern Great Plains as of July 1990.

State	Total CRP acres	Wetland acres in CRP
Montana	2,720,133	1,128
Minnesota	1,830,672	4,609
North Dakota	3,137,199	111,612
South Dakota	2,084,557	135,650
Nebraska	1,348,929	2,730
Total	11,121,490	255,729

about $10 billion in natural resource benefits (Ribaudo et al. 1989). These benefits include decreases in soil erosion and increases in soil productivity, water quality, air quality, groundwater supply, and wildlife habitat.

In the Great Plains, establishment of CRP has reduced soil loss from highly erodible lands by an estimated 23 tons per acre per year (Harris et al. 1989). The value of soil productivity will increase by an estimated $216 million in the northern Great Plains over the course of the program (Ribaudo et al. 1989). The region will also accrue $306 million in water quality benefits, and aquifer life will be increased due to reduced irrigation (Ribaudo et al. 1989.) Reduced wind erosion will result in $148 million in air quality benefits (Ribaudo et al. 1989).

Participation in CRP takes cropland out of production for 10 years. In North Dakota, 77% of 1,289 surveyed landowners agreed that CRP will benefit them financially (Mortenson et al. 1989). Forty-one percent of these producers indicated that CRP income exceeded their cash farm income and about 21% said the program enabled them to continue farming. In Montana, CRP raised the net income of producers even though they experienced a decline in gross revenues (Standaert and Smith 1989).

Many rural communities experienced positive impacts from initial expenditures for establishing permanent cover on CRP lands. However, after the initial establishment of CRP stands, some negative impacts may accrue to local economies because enrolled acres do not require annual expenditures for fertilizer, chemicals, fuels, machinery repair, or use-related depreciation for these same lands.

The negative impacts of reduced spending may be underestimated in rural areas that are largely dependent on sales of agricultural related items (Mortenson et al. 1990, Standaert and Smith 1989). In North Dakota, CRP land taken out of production reduced direct expenditures by $56 million, mainly affecting the retail sector. Reduction in direct expenditures decreased overall business sales by $141 million for the state. However, these negative impacts did not exceed 1% of North Dakota's baseline business volume (Mortenson et al. 1990)

Derived personal income is shifting from the agricultural sector to the nonagricultural sector. However, individual counties or rural communities may suffer large declines in personal income because CRP induced shifts in employment from the agriculture to the nonagriculture sector may not be compensated for in the local communities. Also, restructuring of job opportunities in small local communities may not take place (Standaert and Smith 1989). Fewer employment opportunities may accelerate the current trend of out-of-state migration of youth from farm-dependent communities (Harris et al. 1989). However, by 1987, CRP-related potential employment in North Dakota was reduced by less than 1%, and most of this loss was concentrated in the most agriculturally dependent rural areas (Mortenson et al. 1989).

Another economic concern is that CRP-derived income may be spent disproportionately out of state. However, older North Dakota farmers were more likely to participate in the program (Mortenson et al. 1990) than younger farmers, and less than 3.5% intended to spend their CRP income on retirement or out-of-state leisure travel (Mortenson et al. 1988). Consequently, most CRP monies will probably remain in state.

Impacts on Wildlife

CRP acres add habitat diversity to agricultural landscapes and increase habitat quality for wildlife dependent on farmland. Recently, in eastern South Dakota, white-tailed deer selected CRP grasslands during spring green-up and the fawning season (J. Gould, SDSU, personal communication). Other studies have indicated that grasslands similar to those in CRP are important to numerous species of wildlife including deer, ducks, upland gamebirds, shorebirds, hawks, owls, and passerines (Berner 1988; Duebbert and Kantrud 1974; Duebbert and Lokemoen 1976, 1977; Higgins et al. 1984; Kirsch et al. 1973; Klett et al. 1984).

During the past 5 years, various natural resource agencies and private groups have combined their programs with CRP to provide additional wildlife benefits and economic incentives to landowners. For example, the U.S. Fish and Wildlife Service has a Piggyback Program whereby CRP contract holders receive an additional one-time payment for restoring formerly drained wetlands within a CRP tract. Wetlands in the northern Great Plains have long been valued as critical habitat for migratory birds, fishes, and furbearers. Their value for wildlife is greatly enhanced when they are adjacent to CRP fields (Higgins et al. 1988).

In South Dakota, the Department of Game, Fish, and Parks cooperates with local private groups to provide funding for winter food-plots for wildlife. Recent research at South Dakota State University indicates higher pheasant use of winter food plots when they are within or adjacent to grasslands such as CRP (P. L. Crookston, SDSU, personal communication).

Wildlife Benefits with Special Emphasis on Waterfowl

A substantial portion of the Prairie Pothole Region is in the northern Great Plains. Although the Prairie Pothole Region covers only 12% of the total waterfowl breeding grounds in North America, it is used by 41% of the continent's breeding dabbling ducks (Bellrose 1979) and about 50% of the continental breeding mallards (Pospahala et al. 1974). Thus, any factors that affect waterfowl production in the northern Great Plains are of continental significance.

Resources to maintain and enhance waterfowl populations are beyond the land-area capabilities of natural resource agencies. Thus, long-term solutions largely depend on future private land use and large federal farm programs. Upland nesting habitat created by CRP on private lands is an essential component of the current North American waterfowl population restoration plan (USDI CWS 1986).

Past studies have demonstrated the benefits of former land retirement programs of the U.S. Department of Agriculture that provided grassland cover for upland nesting ducks (Duebbert 1969, Duebbert and Lokemoen 1976, Klett et al. 1984). The large grassland habitat base created by the current CRP has again prompted wildlife managers to be optimistic, but habitat creation depends mostly on annual precipitation and willingness by farmers to enter CRP. For example, during the first 5 years of CRP, maximum wildlife benefits were not reached in much of the northern Great Plains because of severe drought and a shortage of livestock forage. To compensate for the forage shortage, many CRP contract holders were given the option to hay their CRP lands.

In 1988, landowners who opted to hay their CRP acres had to leave at least 10% of each tract in idled strips. To determine the effect of haying on wildlife, we evaluated the posttreatment effects of the 1988 haying on nest success (Klett et al. 1986, Mayfield 1975) during 1989. In 1989, 146 duck nests were found on 1,263 CRP acres in eastern South Dakota (table 2). Nest densities averaged nearly 4 times higher in the narrow idled strips and idled fields than in hayed strips, whereas nesting success averaged 3 times higher in hayed strips and idle fields than in idled strips (table 2). Idled strips apparently attracted ducks as well as predators, primarily mammals. Greatest benefits to upland nesting ducks were found in idled fields which resulted in both high densities and high nesting success relative to the idle or hayed strips (table 2).

In 1989, landowners in drought-stricken counties again had the option of haying CRP tracts but with the provision that 25% be left in idled blocks rather than in strips. To determine the effect of the 1989 haying, we evaluated the posttreatment effect on nest success during 1990. In 1990, 266 duck nests were located on 1,756 acres in eastern South Dakota. Preliminary analysis of our 1990 findings indicates that a haying option in which 25% of cover was left in blocks (table 3) may have been more beneficial to nesting ducks during 1990 than were the 10% areas left in idled strips during 1989 (table 2).

Average nest success rates of 21.0% in 1989 and 26.9% in 1990 indicate CRP in eastern South Dakota is producing waterfowl at rates greater than the 15.2% rate required to sustain mallard populations (Cowardin et al. 1985). Even though our data indicates that ducks are producing at rates high enough to sustain or slightly increase their populations, we believe success would have been even better had it not been for the drought. Use of CRP habitat by upland nesting ducks varies with wetland condition. Below average snowpack and rain in some counties resulted in poor wetland condition and lower nest densities than in counties with adequate precipitation and good to excellent wetland condition. The continuing drought is one of the major factors contributing to low waterfowl numbers.

Recommendations for Future Rejuvenation and Haying of CRP

Seed mixtures similar to those on CRP grasslands generally do not produce stands that maintain structural qualities for more than 7 years (Higgins and Barker 1982). However, most stands of CRP in the northern Great Plains will probably not need rejuvenation through the 10-year contract period because of the 1988 or 1989 emergency haying. Fields that were not hayed in 1988 or 1989 may benefit from at least one rejuvenation treatment that should not occur until after the sixth growing season (Higgins and Barker 1982).

Future of CRP Acres

Some contract holders are concerned that all CRP fields will fall under the sodbuster provision rather than

Table 2.—Upland duck nesting in CRP fields in eastern South Dakota in 1989.

Cover	Nests found	Acres searched	Nest density per 100 acres	Nesting success
Hayed strip	71	980.3	7.2	27.1%
Idled strip	31	104.6	29.6	7.9%
Idled field	44	178.7	24.6	21.5%
Totals	146	1,263.6	11.6	21.0%

Table 3.—Upland duck nesting in CRP fields in eastern South Dakota in 1990.

Cover	Nests found	Acres searched	Nest density per 100 acres	Nesting success
Hayed block	88	293.7	30.0	31.3%
Idled block	33	150.9	21.9	25.5%
Idled field	145	1,311.7	12.0	25.0%
Totals	266	1,756.3	15.1	26.9%

conservation compliance requirements of the 1985 Food Security Act (P.L. 99–198). However, the Great Plains Agricultural Council recommends that upon contract expiration, imposing sodbuster requirements retroactively would not be consistent with previously signed contracts (Harris et al. 1989).

The Soil Conservation Service has land management criteria for farm program participants. For example, if highly erodible land (HEL) map units are greater than one-third of the field size, the soil erosion index is greater than 8, or soil is eroding at a rate of 3T or greater, operators must have a conservation compliance plan. Land with lower erosion rates are not highly erodible and, thus, will not be subject to sodbuster provisions. If compliance acres are not farmed according to such plans, operators will be ineligible to participate in federal farm commodity programs.

Summary and Recommendations

The Conservation Reserve Program demonstrates USDA conservation and set-aside programs can provide incentives for landowners to protect natural resources. Economic impacts of CRP have been modest in the northern Great Plains. However, socioeconomic impacts resulting from the CRP are not distributed uniformly among states or counties in the region and may have more adverse effects on agriculturally dependent communities (Mortenson et al. 1990, Standaert and Smith 1989).

The majority of contract holders agree that CRP provides wildlife habitat and protects fragile land (Mortenson et al. 1989). Overall, the entire nation receives many benefits from reduced soil erosion. Agricultural and sparsely populated areas may have the lowest per-acre natural resource benefits even though physical improvement in quality of resources may be just as great or greater (Ribaudo et al. 1989).

Grassland habitat provided by CRP in the northern Great Plains is important to wildlife, particularly upland nesting game birds and ducks. With the return to wetter precipitation patterns, CRP has the potential to attract and produce even larger numbers of upland nesting waterfowl than found during our study. If emergency haying or rejuvenation treatments are necessary, we recommend that cover be left in idled blocks instead of narrow idled strips.

Literature Cited

Bellrose, F. C. 1979. Species distribution, habitats and characteristics of breeding dabbling ducks in North America. In: Bookhout, T. A., ed. Waterfowl and wetlands—an integrated review: proceedings, 1977 symposium, Midwest fish and wildlife conference; Madison, WI. North Central Section, The Wildlife Society: 1–15.

Berner, A. H. 1988. Federal pheasants—impacts of federal agricultural programs on pheasant habitat, 1934–1985. Pages In: Pheasants: symptoms of wildlife problems on agricultural lands: proceedings, 1987 symposium, Midwest fish and wildlife conference; Milwaukee, WI. North Central Section, The Wildlife Society: 45–95.

Cowardin, L. M.; Gilmer, D. S.; Shaiffer, C. W. 1985. Mallard recruitment in the agricultural environment of North Dakota. Wildlife Monographs 92. 37 p.

Duebbert, H. F. 1969. High nest density and hatching success of ducks on South Dakota CAP land. Transactions North American Wildlife Natural Resource Conference. 34: 218–229.

Duebbert, H. F.; Kantrud, H. A. 1974. Upland duck nesting related to land use and predator reduction. Journal of Wildlife Management. 38: 257–265.

Duebbert, H. F.; Lokemoen, J. T. 1976. Duck nesting in fields of undisturbed grass-legume cover. Journal of Wildlife Management. 40: 39–49.

Duebbert, H. F.; Lokemoen, J. T. 1977. Upland nesting of American bitterns, marsh hawks, and short-eared owls. Prairie Naturalist. 9: 33–40.

Harris, B. L.; Habiger, J. N.; Carpenter, Z. L. 1989. The conservation title: concerns and recommendations from the Great Plains. Journal Soil and Water Conservation. 44(5): 507–509.

Higgins, K. F.; Arnold, T. W.; Barta, R. M. 1984. Breeding bird community colonization of sown stands of native grasses in North Dakota. Prairie Naturalist. 16: 177–182.

Higgins, K. F.; Barker, W. T. 1982. Changes in vegetation structure in seeded nesting cover in the Prairie Pothole Region. Spec. Sci. Rep., Wildl. 242. U.S. Department of the Interior, Fish and Wildlife Service. 26 p.

Higgins, K. F.; Nomsen, D. E.; Wentz, W. A. 1988. Role of the Conservation Reserve Program in relation to wildlife enhancement, wetlands and adjacent habitats in the northern Great Plains: proceedings, 1987 symposium, Impacts of the Conservation Reserve Program in the Great Plains. Gen. Tech. Rep. RM-158. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 99–104.

Kirsch, L. M.; Klett, A. T.; Miller, H. W. 1973. Land use and prairie grouse population relationships in North Dakota. Journal of Wildlife Management. 37: 449–453.

Klett, A. T.; Duebbert, H. F.; Faanes, C. A.; Higgins, K. F. 1986. Techniques for studying nest success of ducks in upland habitats in the prairie pothole region. Resourc. Publ. 158. U.S. Fish and Wildlife Service. 24 p.

Klett, A. T.; Duebbert, H. F.; Heismeyer, G. L. 1984. Use of seeded native grasses as nesting cover by ducks. Wildlife Society Bulletin. 12: 134–138.

Mayfield, H. 1975. Suggestions for calculating nest success. Wilson Bulletin. 87: 456–466.

Mitchell, J. E., ed. 1988. Proceedings, 1987 symposium, Impacts of the Conservation Reserve Program in the Great Plains. Gen. Tech. Rep. RM-158. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 135 p.

Mortenson, T. L.; Leistritz, F. L.; Leitch, J. A.; Coon, R. C.; Ekstrom, B. L. 1988. Socioeconomic impact of the Conservation Reserve Program in North Dakota. Society and Natural Resources. 3:53–61.

Mortenson, T. L.; Leistritz, F. L.; Leitch, J. A.; Coon, R. C.; Ekstrom, B. L. 1989. Landowner characteristics and economic impact of the Conservation Reserve Program in North Dakota. Journal Soil and Water Conservation. 44(5): 494–497.

Mortenson, T. L.; Leistritz, F. L.; Leitch, J. A.; Ekstrom, B. L. 1988. A baseline analysis of participants in the Conservation Reserve Program in North Dakota. Agric. Econ. Misc. Rep. No. 120. North Dakota State University, Department of Agricultural Economics. 35 p.

Pospahala, R. S.; Anderson, D. R.; Henney, C. J. 1974. Population ecology of the mallard. II. Breeding habitat conditions, size of the breeding populations, and production indices. Resourc. Publ. 115. U.S. Fish and Wildlife Service. 73 p.

Ribaudo, M. C.; Piper, S.; Schaible, G. D.; Langner, L. L.; Colacicco, D. 1989. CRP—what economic benefits? Journal Soil and Water Conservation. 44(5): 421–424.

Standaert, J. E.; Smith, H. A. 1989. CRP effects on Montana's economy. Journal Soil and Water Conservation. 44(5): 507–509.

U.S. Department of Interior, Canadian Wildlife Service. 1986. North American waterfowl management plan: a strategy for cooperation. Ottawa, Ontario: Environment Canada. 31 p.

The CRP in Oregon's Columbia Basin: A Local Perspective

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Abstract.—The initiation of the CRP gave farmers within Morrow County new options. Although many operations with eligible land took advantage of the program, the opinions within the county on the program are highly variable. The experience of one operation is presented.

Introduction

CRP in Wasco, Sherman, Gilliam, Umatilla, and Morrow Counties covers 394,478 acres out of 513,105 acres in Oregon, or 77%. In several of these counties, this acreage is at the legal limit of 25% of eligible cropland. This part of Oregon's Columbia Basin lies south of the west-flowing Columbia River and the land slopes north to south from perhaps less than 500 feet to approximately 3,000 feet. Summer fallow wheat is the primary agricultural enterprise on dryland. Adjacent rangelands originally were largely dominated by bluebunch wheatgrass on south-facing slopes and level areas and Idaho fescue on north-facing slopes. As is true almost universally, the more productive rangelands were plowed. Over time, much of the less productive ecological sites also came under the plow. The initiation of the CRP gave local farmers some new options and many had eligible land and could take advantage of the program.

The case example for this presentation is drawn from Morrow County, which is typical of the land and the sociology of the area. Heppner is the county seat with approximately 1,500 people. Only two other towns are of any size (1,000 and 200). Heppner does have one rather large lumber mill; however, the dominant economy in the county traditionally depends upon agriculture. The physical and resource benefits of establishing good stands of grass are well recognized by farmer and townspeople alike after they see how gullies are healed and erosion rates sharply curtailed.

However, where agricultural practices tend to be more or less the same year after year, a new program such as CRP became one of the more controversial issues in Morrow County. Probably no other issue or farm program has affected the entire county as has the Conservation Reserve Program. From the farmer's point of view, there is no question that the variation of benefit ranges from absolute financial salvation to a bitter regret of entry into the program. There are as many opinions as there are farm participants.

Main Street Has Dim View of CRP

From a community standpoint, main street business has generally viewed CRP as an intrusion into the economy of the community. Farm businesses that cater to wheat farming have, in some cases, been forced out of business or others have expanded into other enterprises to survive. From the inception of the program to date, Morrow County has seen over 111,000 acres taken from grain production. This represents almost 25% of the total county acreage available for the program and almost 22% of the state CRP acreage. Participation in the program is largely centered in the southern one-fourth of the county or in the higher and more erodible areas. Agribusinesses that serve this one-fourth are definitely impacted by the dislocation of traditional trading practices.

In addition, one of the fears of both farmers and county officials is the future of CRP land as it relates to taxes to support the county. Will the status change to rangeland? If it does, property assessments will drop, lowering county taxes, and in turn causing the tax rate of non-CRP neighbors to go up. Farm net worth will decline on the local banker balance sheet, which results in less borrowing power for the participant.

Time For Soul Searching

This dislocation or redirection of spending practices has caused perplexing and worrisome problems for those participants. On the one hand, farmers have entered the

program based upon individual financial considerations, for the most part. At the same time, the realization of the cumulative impact on the health of the community caused much psychological discomfort to many and bitterness to others. In some cases, main street resentment has caused conflict between those parties involved.

Not All Glory

CRP participants have not all experienced the panacea that some might have anticipated. Much out-of-pocket expense of seeding grass was experienced. This cost was absorbed by the participant in a short period of time and was aggravated by the supply and demand of available seed which caused prices to skyrocket. Unfortunately, poor quality seed, in many cases, introduced weeds that needed to be controlled. Reseeding was necessary in some cases because of lack of previous experience in massive grass seeding and because of faulty technical information.

Participants

Program participants typically fall into three categories.

1. People who, for whatever reason, have put their entire ranch into the program. For the most part, these are commercial operations that must still meet debt loads in land payments, machinery payments, and living expenses.
2. Landowners that placed their entire acreage into the program and retired. Most of these have retired and remained on the farm, holding public auctions to dispose of machinery which depressed the machinery market and diverted trading practices from traditional agribusiness into retirement accounts and, thus, from the economy.
3. Participants that put only the most erodible portion into the program and continued to farm almost without impact on the community. In many cases, cattle operations were involved in the higher elevations and in the more questionable farming areas. To a large extent, the restrictions on grazing CRP caused many operators to disperse herds and, thus, lose a source of income. In these cases, family members that were depending on cattle revenues to support themselves found that CRP was adequate only for debt service and maintenance of the farm. In this case, they were forced to seek employment elsewhere along with their former employee, the hired man.

A Specific Case History

The Carlson operation (4-C Ranches) farmed approximately 3,000 acres per year in a summer fallow rotation on predominantly rented or leased land in the core of erodible areas. Profit margins are small and debt load is above average.

The theory of dominos best characterizes the 4-C Ranches' involvement in the program. It was one of the early entries into CRP. This family-owned corporation consists of 5 separate units. Unit number 1 was enrolled in the first signup with about 530 acres of highly erodible land. Almost as soon as this was completed, a landlord of unit number 2 found herself in an estate situation that demanded either liquidation or enter into an agreement with the program for a larger CRP dollar payment than previously gleaned from the land under wheat production. The results were that her property was put into CRP to save the ranch. In other words, the guaranteed payment over a 10-year period paid off her debt load and satisfied her creditor.

The third unit farm owner, now retired, also made the decision to go CRP, as did the fourth and fifth. This left the base operation, a relatively small farm, the only surviving entity not consumed by the program. This farm, too, was eventually signed up to round out a maximum of three CRP rental limitations. To accommodate this, an additional farm corporation and a partnership were formed with participating sons. Totally separate operations were formed with sale of equipment to each.

Because of inadequate income, the results of this domino effect resulted in the two Carlson sons developing another business and eventually removing themselves from the 4-C Ranches' payroll. An entire herd of cows was sold because of dependency on winter wheat land pasture. Mr. Carlson removed himself from 4-C payroll because of inadequate income and successfully obtained an elected public office. Mrs. Carlson draws a nominal wage from the farm for bookkeeping services but must also be employed by our school system to make ends meet.

Immediate expenses for seeding grass, spraying weeds, etc., has essentially used the revenue from the sale of the cattle. Payments from CRP are making land payments, machinery payments, and day-to-day operating costs. At the end of the contract, the ranch will have the machinery paid for and most of the land paid for but will have to borrow for the operating line.

The plan for the future is to leave the most marginal land in grass and increase our cattle operation on our own land. Rented marginal land will most likely stay in grass if payments are equal to existing payments. Questionable land will stay in grass if there is an inflation factor added or grazing privileges granted. More productive land will most likely be put back into wheat production under any circumstances due to its potential for higher yields after 10 years of retirement.

Options For The Future

What the future holds for CRP depends on **flexibility**. Preservation of wheat base for land enrolled in

the program is paramount in the minds of landowners. The ability to mix and match acres for grass and wheat production from separate operating units is critical. Combinations of options might include:

1. Contract renewals on all or portion of units.
2. Renewals with at least existing payments or the equivalent.
3. Grazing privileges (rental from the federal government at local prices).
4. Consideration for inflation, higher interest rates, higher taxes, etc.
5. Consideration on individual communities impact.

Summary

Certainly, recognition of the success of CRP must be made. Government grain stocks are now reduced to very manageable levels. Farm prices now reflect a margin of profit that was not apparent 3–4 years ago. Highly erodible land is protected by grass cover and public opinion, in general, accepts the program as environmentally correct.

The overriding goal of the CRP is soil conservation, controlled grain stocks, and reduced government spending. In order for land to stay in permanent cover when 10-year contracts expire, farmers must have adequate profit margins in relation to their land investments. All people must recognize that for land resource benefits to continue, farmers must continue to benefit, too.

Joyce, Linda A., Mitchell, John E., Skold, Melvin D., editor. 1991. The Conservation Reserve—Yesterday, Today and Tomorrow: Symposium Proceedings. [Washington, DC, January 14, 1991] USDA Forest Service General Technical Report RM-203, 65 p. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.

The Conservation Reserve Program provided opportunities to reduce soil erosion, enhance wildlife habitat and water quality, and reduce commodity surpluses. The predominant question—what will happen to the CRP lands when the 10-year contracts begin to expire in 1996—was the focus of this symposium. This question was addressed from the perspective of impacts on people and impacts on resources.

Keywords: Agricultural Resources Conservation Program, economics, livestock, crop production, wildlife, recreation, cropland, environmental quality, research, sociological effects, farm policy, legislation, land conversion.

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